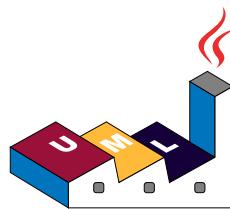


# Drawing UML with PlantUML



## PlantUML Language Reference Guide

(Version 1.2023.11)

**PlantUML** is a component that allows to quickly write :

- Sequence diagram
- Usecase diagram
- Class diagram
- Object diagram
- Activity diagram
- Component diagram
- Deployment diagram
- State diagram
- Timing diagram

The following non-UML diagrams are also supported:

- JSON Data
- YAML Data
- Network diagram (nwdiag)
- Wireframe graphical interface
- Archimate diagram
- Specification and Description Language (SDL)
- Ditaa diagram
- Gantt diagram
- MindMap diagram
- Work Breakdown Structure diagram
- Mathematic with AsciiMath or JLaTeXMath notation
- Entity Relationship diagram

Diagrams are defined using a simple and intuitive language.

# 1 Sequence Diagram

Creating sequence diagrams with PlantUML is remarkably straightforward. This ease of use is largely attributed to the user-friendly nature of its syntax, designed to be both intuitive and easy to remember.

- **Intuitive Syntax:**

First and foremost, users appreciate the straightforward and intuitive syntax that PlantUML employs. This well-thought-out design means that even those new to diagram creation find it easy to grasp the basics quickly and without hassle.

- **Text-to-Graphic Correlation:**

Another distinguishing feature is the close resemblance between the textual representation and the graphical output. This harmonious correlation ensures that the textual drafts translate quite accurately into graphical diagrams, providing a cohesive and predictable design experience without unpleasant surprises in the final output.

- **Efficient Crafting Process:**

The strong correlation between the text and the graphical result not only simplifies the crafting process but also significantly speeds it up. Users benefit from a more streamlined process with fewer requirements for time-consuming revisions and adjustments.

- **Visualization While Drafting:**

The ability to envisage the final graphical outcome while drafting the text is a feature that many find invaluable. It naturally fosters a smooth transition from initial draft to final presentation, enhancing productivity and reducing the likelihood of errors.

- **Easy Edits and Revisions:**

Importantly, editing existing diagrams is a hassle-free process. Since the diagrams are generated from text, users find that making adjustments is considerably easier and more precise than altering an image using graphical tools. It boils down to simply modifying the text, a process far more straightforward and less prone to errors than making changes through a graphical interface with a mouse.

PlantUML facilitates a straightforward and user-friendly approach to creating and editing sequence diagrams, meeting the needs of both novices and seasoned designers alike. It skillfully leverages the simplicity of textual inputs to craft visually descriptive and accurate diagrams, thereby establishing itself as a must-have tool in the diagram creation toolkit.

You can learn more about some of the common commands in PlantUML to enhance your diagram creation experience.

## 1.1 Basic Examples

In PlantUML sequence diagrams, the `->` sequence denotes a message sent between two participants, which are automatically recognized and do not need to be declared beforehand.

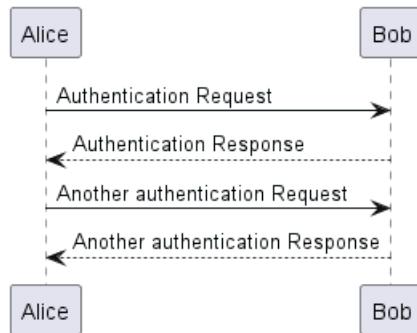
Utilize dotted arrows by employing the `-->` sequence, offering a distinct visualization in your diagrams.

To improve readability without affecting the visual representation, use reverse arrows like `<-` or `<--`. However, be aware that this is specifically for sequence diagrams and the rules differ for other diagram types.

```
@startuml
Alice -> Bob: Authentication Request
Bob --> Alice: Authentication Response

Alice -> Bob: Another authentication Request
Alice <-- Bob: Another authentication Response
@enduml
```





## 1.2 Declaring participant

If the keyword `participant` is used to declare a participant, more control on that participant is possible.

The order of declaration will be the (default) **order of display**.

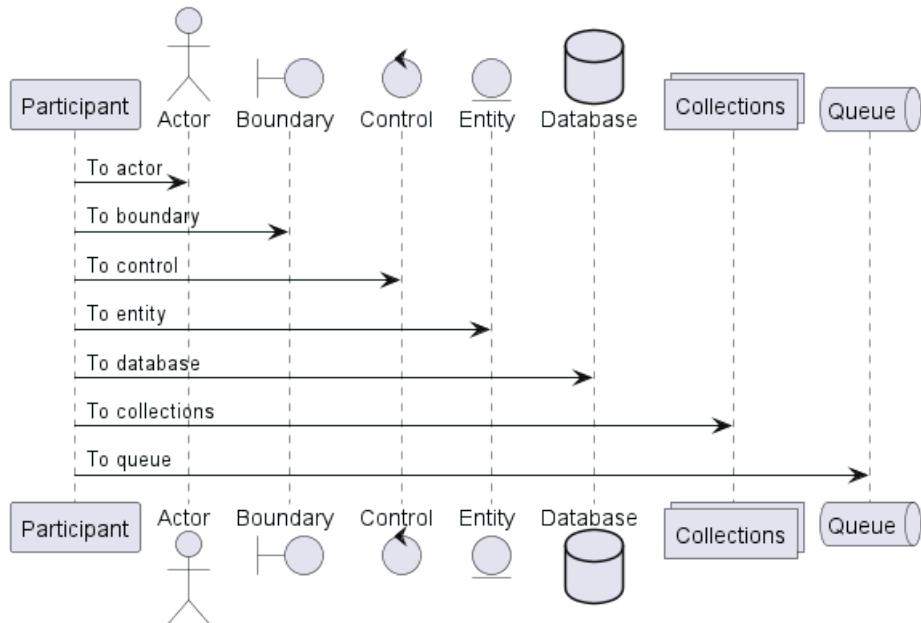
Using these other keywords to declare participants will **change the shape** of the participant representation:

- `actor`
- `boundary`
- `control`
- `entity`
- `database`
- `collections`
- `queue`

```

@startuml
participant Participant as Foo
actor      Actor      as Foo1
boundary   Boundary   as Foo2
control    Control    as Foo3
entity     Entity     as Foo4
database   Database   as Foo5
collections Collections as Foo6
queue      Queue      as Foo7
Foo -> Foo1 : To actor
Foo -> Foo2 : To boundary
Foo -> Foo3 : To control
Foo -> Foo4 : To entity
Foo -> Foo5 : To database
Foo -> Foo6 : To collections
Foo -> Foo7: To queue
@enduml
  
```



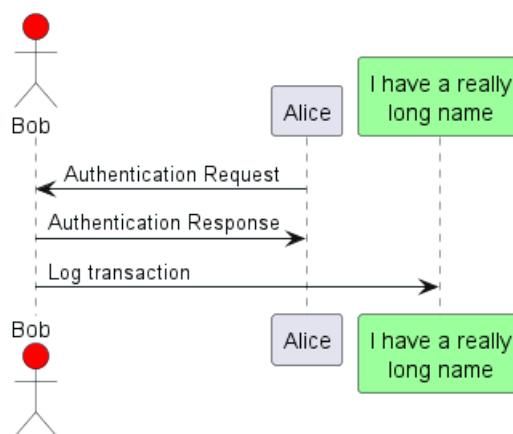


Rename a participant using the `as` keyword.

You can also change the background color of actor or participant.

```
@startuml
actor Bob #red
' The only difference between actor
and participant is the drawing
participant Alice
participant "I have a really\nlong name" as L #99FF99
/' You can also declare:
    participant L as "I have a really\nlong name" #99FF99
'/
```

Alice->Bob: Authentication Request  
Bob->Alice: Authentication Response  
Bob->L: Log transaction  
@enduml

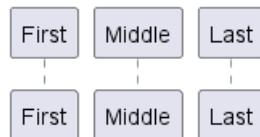


You can use the `order` keyword to customize the display order of participants.

```
@startuml
participant Last order 30
participant Middle order 20
participant First order 10
```



```
@enduml
```



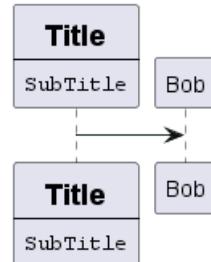
### 1.3 Declaring participant on multiline

You can declare participant on multi-line.

```
@startuml
participant Participant [
    =Title
    -----
    ""SubTitle"""
]

participant Bob

Participant -> Bob
@enduml
```

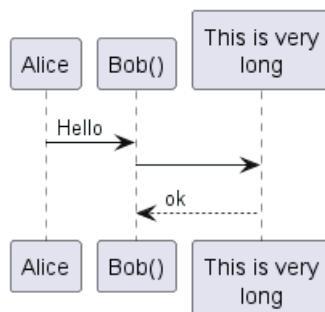


[Ref. QA-15232]

### 1.4 Use non-letters in participants

You can use quotes to define participants. And you can use the `as` keyword to give an alias to those participants.

```
@startuml
Alice -> "Bob()" : Hello
"Bob()" -> "This is very\nlong" as Long
' You can also declare:
' "Bob()" -> Long as "This is very\nlong"
Long --> "Bob()" : ok
@enduml
```

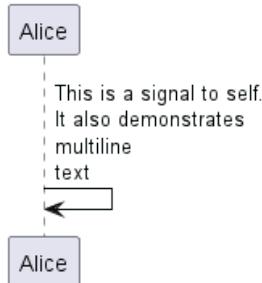


## 1.5 Message to Self

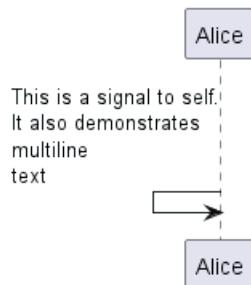
A participant can send a message to itself.

It is also possible to have multi-line using .

```
@startuml
Alice -> Alice: This is a signal to self.\nIt also demonstrates\nmultiline \ntext
@enduml
```



```
@startuml
Alice <- Alice: This is a signal to self.\nIt also demonstrates\nmultiline \ntext
@enduml
```



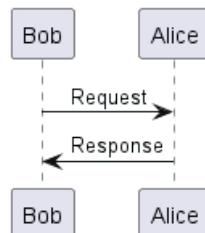
[Ref. QA-1361]

## 1.6 Text alignment

Text alignment on arrows can be set to `left`, `right` or `center` using `skinparam sequenceMessageAlign`.

You can also use `direction` or `reverseDirection` to align text depending on arrow direction. Further details and examples of this are available on the [skinparam page](#).

```
@startuml
skinparam sequenceMessageAlign right
Bob -> Alice : Request
Alice -> Bob : Response
@enduml
```

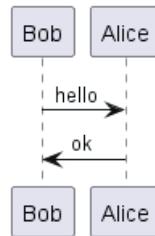


### 1.6.1 Text of response message below the arrow

You can put the text of the response message below the arrow, with the `skinparam responseMessageBelowArrow true` command.



```
@startuml
skinparam responseMessageBelowArrow true
Bob -> Alice : hello
Alice -> Bob : ok
@enduml
```



## 1.7 Change arrow style

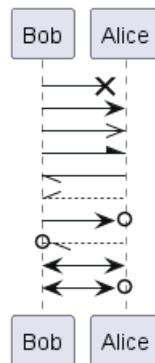
You can change arrow style by several ways:

- add a final `x` to denote a lost message
- use `\` or `/` instead of `<` or `>` to have only the bottom or top part of the arrow
- repeat the arrow head (for example, `>>` or `//`) head to have a thin drawing
- use `--` instead of `-` to have a dotted arrow
- add a final `"o"` at arrow head
- use bidirectional arrow `<->`

```
@startuml
Bob ->x Alice
Bob -> Alice
Bob ->> Alice
Bob -\ Alice
Bob \\- Alice
Bob //-- Alice

Bob ->o Alice
Bob o\\-- Alice

Bob <-> Alice
Bob <->o Alice
@enduml
```



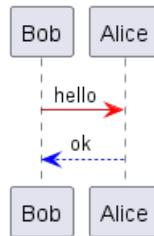
## 1.8 Change arrow color

You can change the color of individual arrows using the following notation:

```
@startuml
```



```
Bob -[#red]> Alice : hello
Alice -[#0000FF]->Bob : ok
@enduml
```



## 1.9 Message sequence numbering

The keyword `autonumber` is used to automatically add an incrementing number to messages.

```
@startuml
autonumber
Bob -> Alice : Authentication Request
Bob <- Alice : Authentication Response
@enduml
```



You can specify a startnumber with `autonumber <start>`, and also an increment with `autonumber <start> <increment>`.

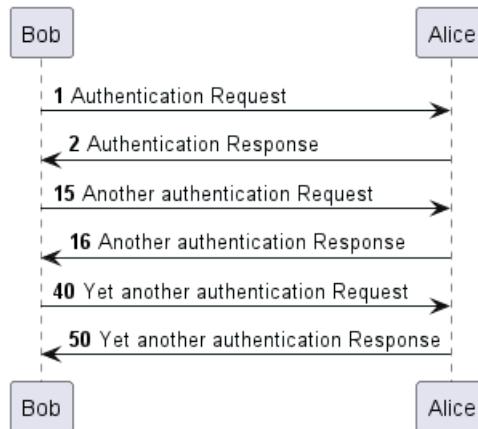
```
@startuml
autonumber
Bob -> Alice : Authentication Request
Bob <- Alice : Authentication Response

autonumber 15
Bob -> Alice : Another authentication Request
Bob <- Alice : Another authentication Response

autonumber 40 10
Bob -> Alice : Yet another authentication Request
Bob <- Alice : Yet another authentication Response

@enduml
```





You can specify a format for your number by using between double-quote.

The formatting is done with the Java class `DecimalFormat` (0 means digit, # means digit and zero if absent).

You can use some html tag in the format.

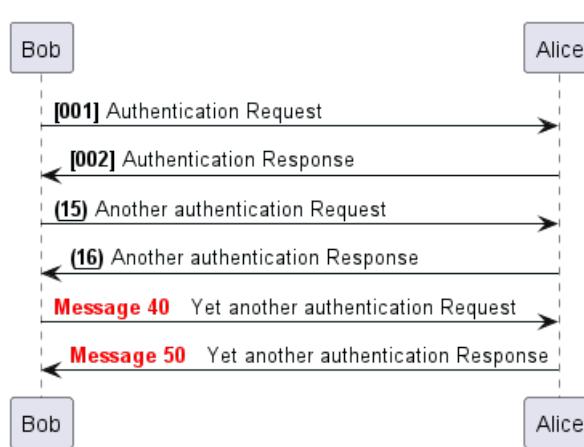
```

@startuml
autonumber "<b>[000]</b>"
Bob -> Alice : Authentication Request
Bob <- Alice : Authentication Response

autonumber 15 "<b>(<u>##</u>)</b>"
Bob -> Alice : Another authentication Request
Bob <- Alice : Another authentication Response

autonumber 40 10 "<font color=red><b>Message 0 </b></font>"
Bob -> Alice : Yet another authentication Request
Bob <- Alice : Yet another authentication Response

@enduml
  
```



You can also use `autonumber stop` and `autonumber resume <increment> <format>` to respectively pause and resume automatic numbering.

```

@startuml
autonumber 10 10 "<b>[000]</b>"
Bob -> Alice : Authentication Request
Bob <- Alice : Authentication Response

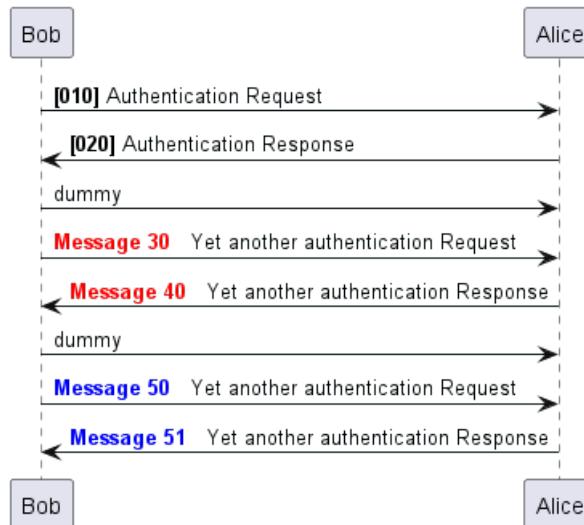
autonumber stop
Bob -> Alice : dummy
  
```



```
autonumber resume "<font color=red><b>Message 0 </b></font>"  
Bob -> Alice : Yet another authentication Request  
Bob <- Alice : Yet another authentication Response
```

```
autonumber stop  
Bob -> Alice : dummy
```

```
autonumber resume 1 "<font color=blue><b>Message 0 </b></font>"  
Bob -> Alice : Yet another authentication Request  
Bob <- Alice : Yet another authentication Response  
@enduml
```



Your startnumber can also be a 2 or 3 digit sequence using a field delimiter such as ., ;, ,,: or a mix of these. For example: 1.1.1 or 1.1:1.

Automatically the last digit will increment.

To increment the first digit, use: `autonumber inc A`. To increment the second digit, use: `autonumber inc B`.

```
@startuml
autonumber 1.1.1
Alice -> Bob: Authentication request
Bob --> Alice: Response

autonumber inc A
'Now we have 2.1.1
Alice -> Bob: Another authentication request
Bob --> Alice: Response

autonumber inc B
'Now we have 2.2.1
Alice -> Bob: Another authentication request
Bob --> Alice: Response

autonumber inc A
'Now we have 3.1.1
Alice -> Bob: Another authentication request
autonumber inc B
'Now we have 3.2.1
Bob --> Alice: Response
@enduml
```

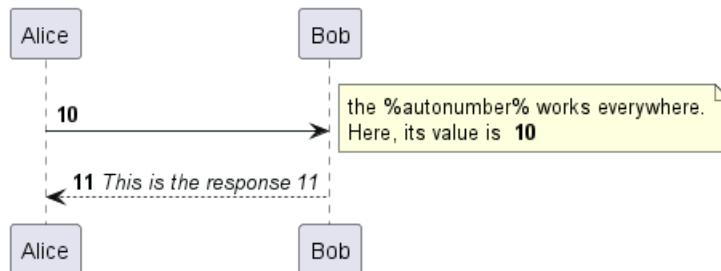




You can also use the value of autonumber with the %autonumber% variable:

```

@startuml
autonumber 10
Alice -> Bob
note right
    the <U+0025>autonumber<U+0025> works everywhere.
    Here, its value is ** %autonumber% **
end note
Bob --> Alice: //This is the response %autonumber%//
@enduml
  
```



[Ref. QA-7119]

## 1.10 Page Title, Header and Footer

The title keyword is used to add a title to the page.

Pages can display headers and footers using header and footer.

```

@startuml

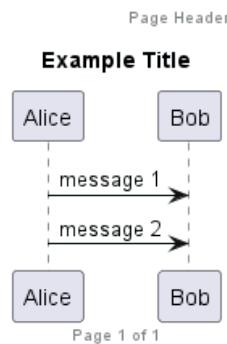
header Page Header
footer Page %page% of %lastpage%

title Example Title

Alice -> Bob : message 1
Alice -> Bob : message 2

@enduml
  
```





## 1.11 Splitting diagrams

The `newpage` keyword is used to split a diagram into several images.

You can put a title for the new page just after the `newpage` keyword. This title overrides the previously specified title if any.

This is very handy with *Word* to print long diagram on several pages.

(Note: this really does work. Only the first page is shown below, but it is a display artifact.)

```
@startuml
```

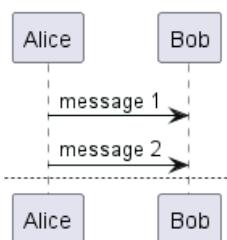
```
Alice -> Bob : message 1
Alice -> Bob : message 2
```

```
newpage
```

```
Alice -> Bob : message 3
Alice -> Bob : message 4
```

```
newpage A title for the\last page
```

```
Alice -> Bob : message 5
Alice -> Bob : message 6
@enduml
```



## 1.12 Grouping message

It is possible to group messages together using the following keywords:

- `alt/else`
- `opt`
- `loop`
- `par`
- `break`
- `critical`



- **group**, followed by a text to be displayed

It is possible to add a text that will be displayed into the header (for **group**, see next paragraph '*Secondary group label*').

The **end** keyword is used to close the group.

Note that it is possible to nest groups.

```
@startuml
Alice -> Bob: Authentication Request

alt successful case

    Bob -> Alice: Authentication Accepted

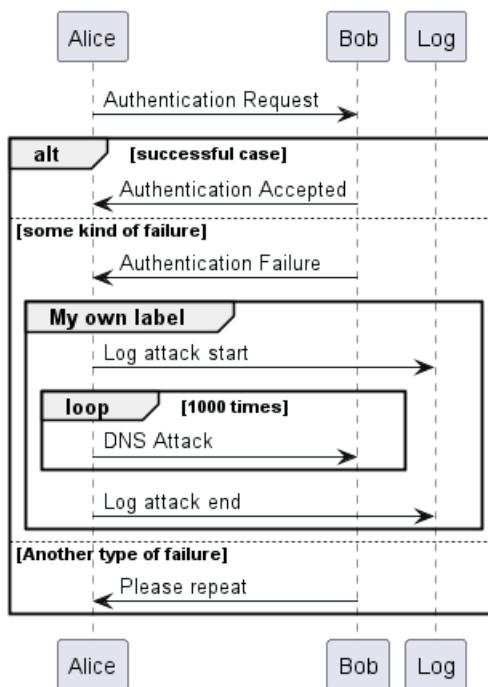
else some kind of failure

    Bob -> Alice: Authentication Failure
    group My own label
        Alice -> Log : Log attack start
        loop 1000 times
            Alice -> Bob: DNS Attack
        end
        Alice -> Log : Log attack end
    end

else Another type of failure

    Bob -> Alice: Please repeat

end
@enduml
```



## 1.13 Secondary group label

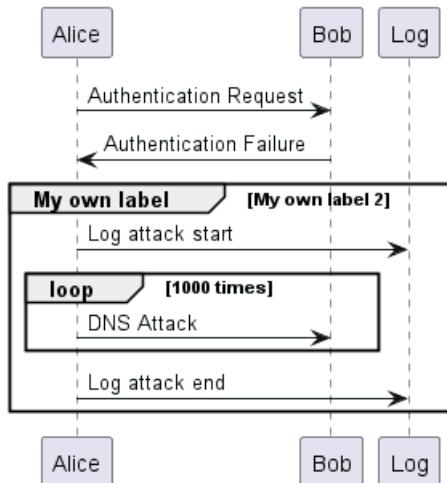
For **group**, it is possible to add, between [ and ], a secondary text or label that will be displayed into the header.



```

@startuml
Alice -> Bob: Authentication Request
Bob -> Alice: Authentication Failure
group My own label [My own label 2]
    Alice -> Log : Log attack start
    loop 1000 times
        Alice -> Bob: DNS Attack
    end
    Alice -> Log : Log attack end
end
@enduml

```



[Ref. QA-2503]

## 1.14 Notes on messages

It is possible to put notes on message using the `note left` or `note right` keywords *just after the message*.

You can have a multi-line note using the `end note` keywords.

```

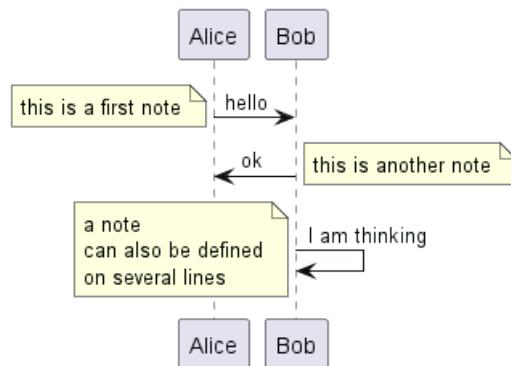
@startuml
Alice->Bob : hello
note left: this is a first note

Bob->Alice : ok
note right: this is another note

Bob->Bob : I am thinking
note left
a note
can also be defined
on several lines
end note
@enduml

```





## 1.15 Some other notes

It is also possible to place notes relative to participant with `note left of`, `note right of` or `note over` keywords.

It is possible to highlight a note by changing its background color.

You can also have a multi-line note using the `end note` keywords.

```

@startuml
participant Alice
participant Bob
note left of Alice #aqua
This is displayed
left of Alice.
end note

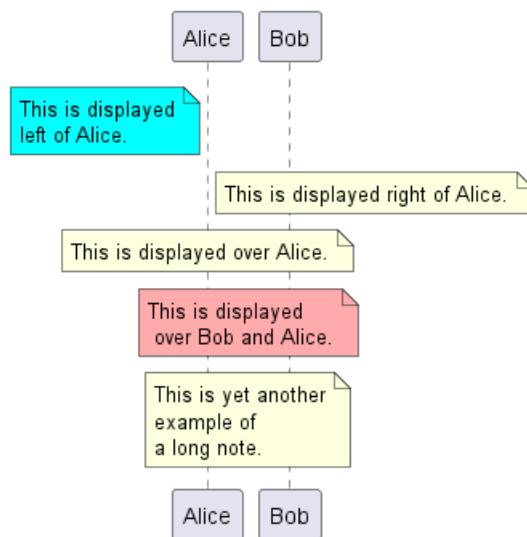
note right of Alice: This is displayed right of Alice.

note over Alice: This is displayed over Alice.

note over Alice, Bob #FFAAAA: This is displayed\n over Bob and Alice.

note over Bob, Alice
This is yet another
example of
a long note.
end note
@enduml
  
```

This code block shows how to use the `note` keyword with various parameters to position notes relative to participants Alice and Bob. It includes examples of single-line notes with different backgrounds, multi-line notes, and notes spanning multiple participants.

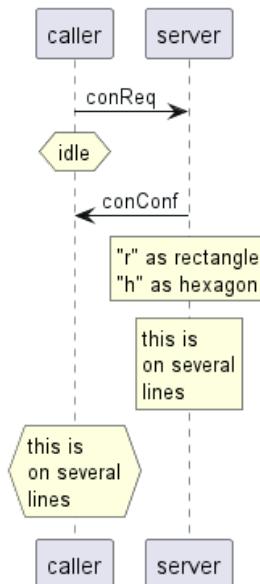


## 1.16 Changing notes shape [hnote, rnote]

You can use `hnote` and `rnote` keywords to change note shapes :

- `hnote` for hexagonal note;
- `rnote` for rectangle note.

```
@startuml
caller -> server : conReq
hnote over caller : idle
caller <- server : conConf
rnote over server
  "r" as rectangle
  "h" as hexagon
endrnote
rnote over server
  this is
  on several
  lines
endrnote
hnote over caller
  this is
  on several
  lines
endhnote
@enduml
```



[Ref. QA-1765]

## 1.17 Note over all participants [across]

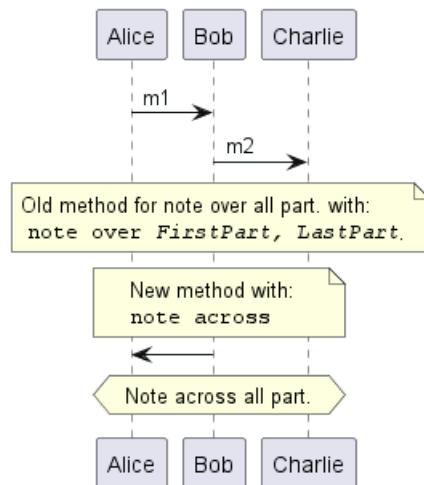
You can directly make a note over all participants, with the syntax:

- `note across: note_description`

```
@startuml
Alice->Bob:m1
Bob->Charlie:m2
note over Alice, Charlie: Old method for note over all part. with:\n ""note over //FirstPart, LastPart"
note across: New method with:\n""note across""
Bob->Alice
hnote across:Note across all part.
```



```
@enduml
```



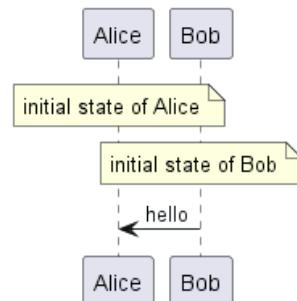
[Ref. QA-9738]

### 1.18 Several notes aligned at the same level [ / ]

You can make several notes aligned at the same level, with the syntax */*:

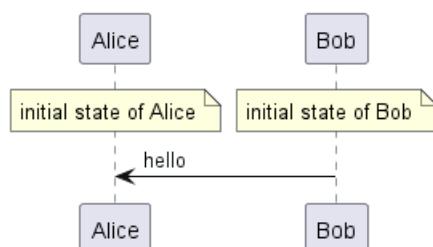
- without */* (*by default, the notes are not aligned*)

```
@startuml
note over Alice : initial state of Alice
note over Bob : initial state of Bob
Bob -> Alice : hello
@enduml
```



- with */* (*the notes are aligned*)

```
@startuml
note over Alice : initial state of Alice
/ note over Bob : initial state of Bob
Bob -> Alice : hello
@enduml
```



[Ref. QA-354]



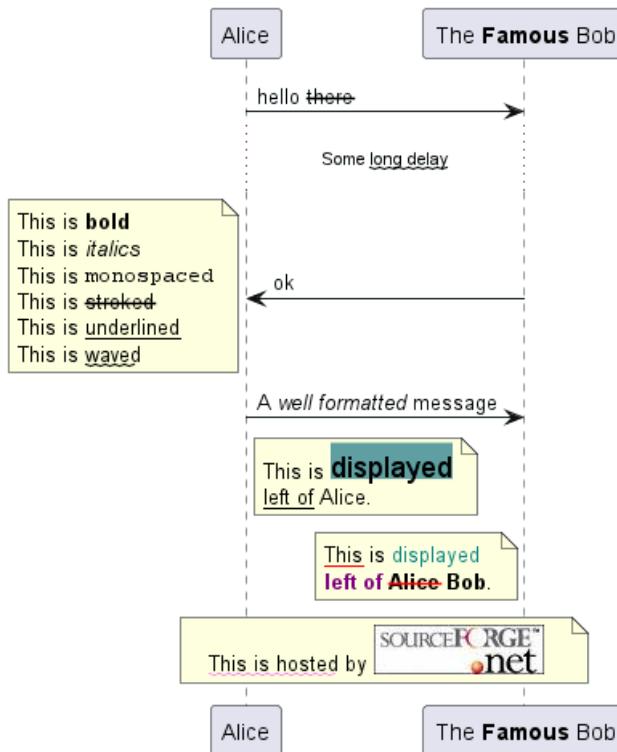
## 1.19 Creole and HTML

It is also possible to use creole formatting:

```
@startuml
participant Alice
participant "The **Famous** Bob" as Bob

Alice -> Bob : hello --there--
.... Some ~~long delay~~ ...
Bob -> Alice : ok
note left
    This is **bold**
    This is //italics//
    This is ""monospaced"""
    This is --stroked--
    This is __underlined__
    This is ~~waved~~
end note

Alice -> Bob : A //well formatted// message
note right of Alice
    This is <back:cadetblue><size:18>displayed</size></back>
    _left of__ Alice.
end note
note left of Bob
    <u:red>This</u> is <color #118888>displayed</color>
    **<color purple>left of</color> <s:red>Alice</strike> Bob**.
end note
note over Alice, Bob
    <w:#FF33FF>This is hosted</w> by <img sourceforge.jpg>
end note
@enduml
```



## 1.20 Divider or separator

If you want, you can split a diagram using == separator to divide your diagram into logical steps.

```
@startuml
```

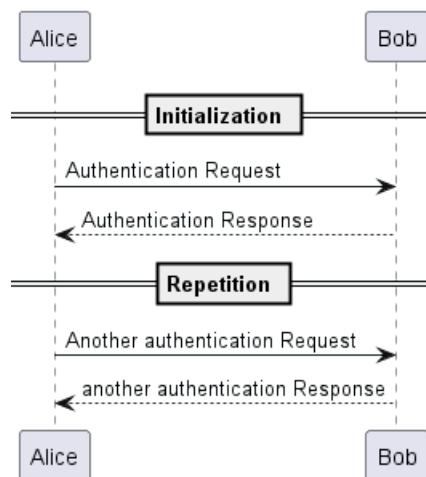
```
== Initialization ==
```

```
Alice -> Bob: Authentication Request
Bob --> Alice: Authentication Response
```

```
== Repetition ==
```

```
Alice -> Bob: Another authentication Request
Alice <-- Bob: another authentication Response
```

```
@enduml
```



## 1.21 Reference

You can use reference in a diagram, using the keyword `ref over`.

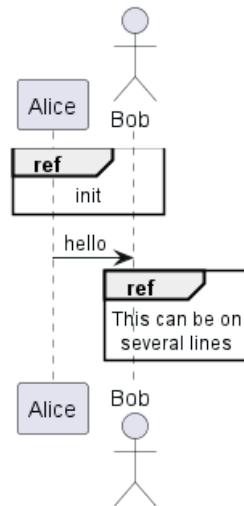
```
@startuml
participant Alice
actor Bob
```

```
ref over Alice, Bob : init
```

```
Alice -> Bob : hello
```

```
ref over Bob
  This can be on
  several lines
end ref
@enduml
```





## 1.22 Delay

You can use `...` to indicate a delay in the diagram. And it is also possible to put a message with this delay.

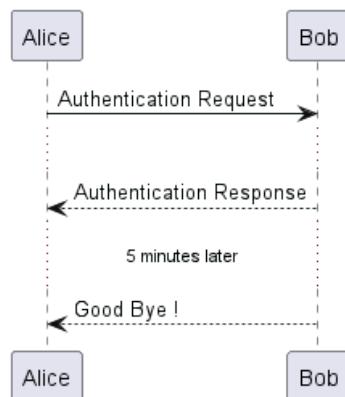
```
@startuml
```

```

Alice -> Bob: Authentication Request
...
Bob --> Alice: Authentication Response
...5 minutes later...
Bob --> Alice: Good Bye !

```

```
@enduml
```



## 1.23 Text wrapping

To break long messages, you can manually add `\n` in your text.

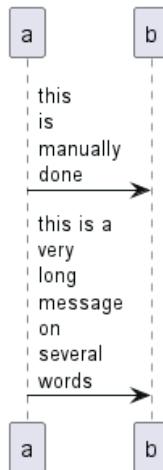
Another option is to use `maxMessageSize` setting:

```

@startuml
skinparam maxMessageSize 50
participant a
participant b
a -> b :this\nis\nmanually\ndone
a -> b :this is a very long message on several words
@enduml

```





## 1.24 Space

You can use ||| to indicate some spacing in the diagram.

It is also possible to specify a number of pixel to be used.

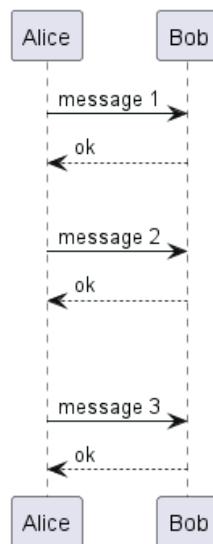
```
@startuml
```

```

Alice -> Bob: message 1
Bob --> Alice: ok
|||
Alice -> Bob: message 2
Bob --> Alice: ok
||45||
Alice -> Bob: message 3
Bob --> Alice: ok

```

```
@enduml
```



## 1.25 Lifeline Activation and Destruction

The **activate** and **deactivate** are used to denote participant activation.

Once a participant is activated, its lifeline appears.

The **activate** and **deactivate** apply on the previous message.



The `destroy` denote the end of the lifeline of a participant.

```
@startuml
participant User

User -> A: DoWork
activate A

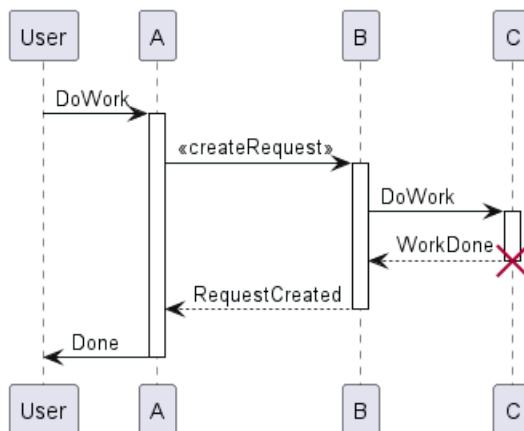
A -> B: << createRequest >>
activate B

B -> C: DoWork
activate C
C --> B: WorkDone
destroy C

B --> A: RequestCreated
deactivate B

A -> User: Done
deactivate A
```

@enduml



Nested lifeline can be used, and it is possible to add a color on the lifeline.

```
@startuml
participant User

User -> A: DoWork
activate A #FFBBBB

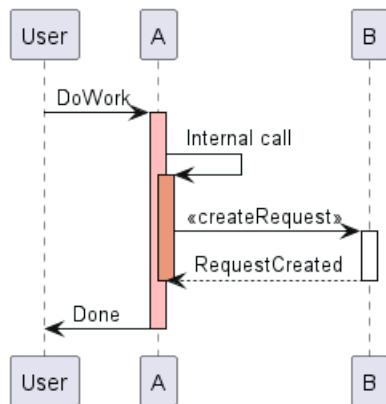
A -> A: Internal call
activate A #DarkSalmon

A -> B: << createRequest >>
activate B

B --> A: RequestCreated
deactivate B
deactivate A
A -> User: Done
deactivate A

@enduml
```



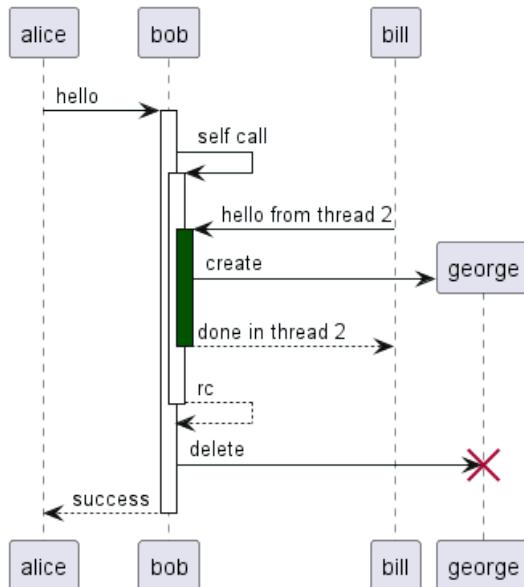


Autoactivation is possible and works with the return keywords:

```

@startuml
autoactivate on
alice -> bob : hello
bob -> bob : self call
bill -> bob #005500 : hello from thread 2
bob -> george ** : create
return done in thread 2
return rc
bob -> george !! : delete
return success
  
```

@enduml



## 1.26 Return

Command **return** generates a return message with optional text label.

The return point is that which caused the most recent life-line activation.

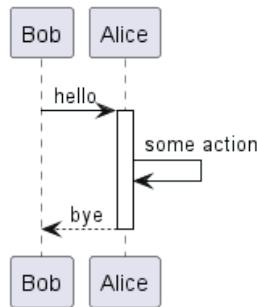
The syntax is **return label** where **label** if provided is any string acceptable for conventional messages.

```

@startuml
Bob -> Alice : hello
activate Alice
Alice -> Alice : some action
  
```



```
return bye
@enduml
```



## 1.27 Participant creation

You can use the `create` keyword just before the first reception of a message to emphasize the fact that this message is actually *creating* this new object.

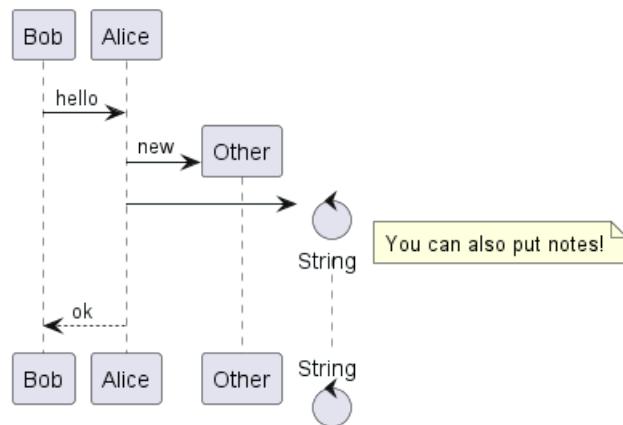
```
@startuml
Bob -> Alice : hello
```

```
create Other
Alice -> Other : new
```

```
create control String
Alice -> String
note right : You can also put notes!
```

```
Alice --> Bob : ok
```

```
@enduml
```



## 1.28 Shortcut syntax for activation, deactivation, creation

Immediately after specifying the target participant, the following syntax can be used:

- `++` Activate the target (optionally a color may follow this)
- `--` Deactivate the source
- `**` Create an instance of the target
- `!!` Destroy an instance of the target

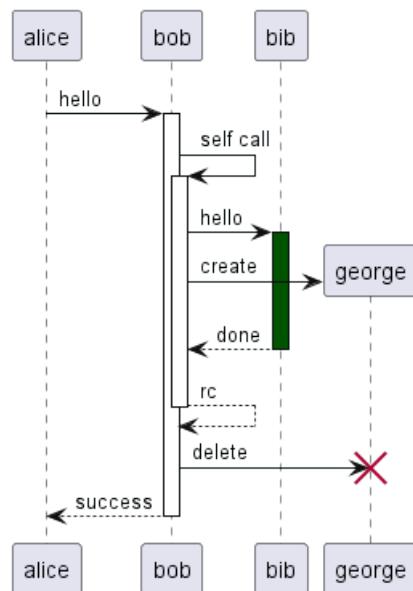
```
@startuml
alice -> bob ++ : hello
```



```

bob -> bob ++ : self call
bob -> bib ++ #005500 : hello
bob -> george ** : create
return done
return rc
bob -> george !! : delete
return success
@enduml

```

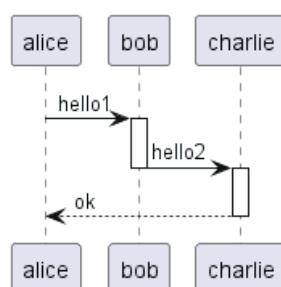


Then you can mix activation and deactivation, on same line:

```

@startuml
alice -> bob ++ : hello1
bob -> charlie ---+ : hello2
charlie --> alice -- : ok
@enduml

```

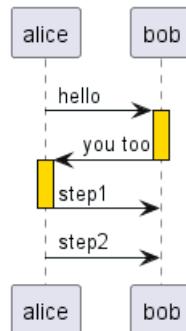


```

@startuml
@startuml
alice -> bob ---+ #gold: hello
bob -> alice ---+ #gold: you too
alice -> bob --: step1
alice -> bob : step2
@enduml
@enduml

```





[Ref. QA-4834, QA-9573 and QA-13234]

## 1.29 Incoming and outgoing messages

You can use incoming or outgoing arrows if you want to focus on a part of the diagram.

Use square brackets to denote the left "[" or the right "]" side of the diagram.

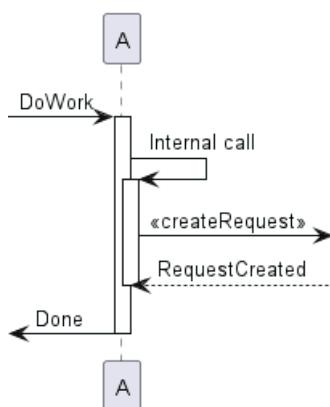
```
@startuml
[-> A: DoWork
```

activate A

```
A -> A: Internal call
activate A
```

```
A ->] : << createRequest >>
```

```
A<--] : RequestCreated
deactivate A
[<- A: Done
deactivate A
@enduml
```



You can also have the following syntax:

```
@startuml
participant Alice
participant Bob #lightblue
Alice -> Bob
Bob -> Carol
...
[-> Bob
[o-> Bob
[o->o Bob
[x-> Bob
```

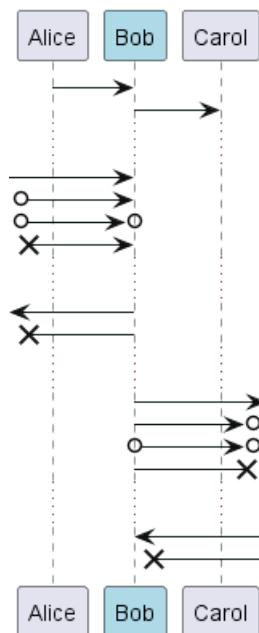


```

...
[<- Bob
[x<- Bob
...
Bob ->]
Bob ->o]
Bob o->o]
Bob ->x]
...
Bob <-]
Bob x<-]

@enduml

```



### 1.30 Short arrows for incoming and outgoing messages

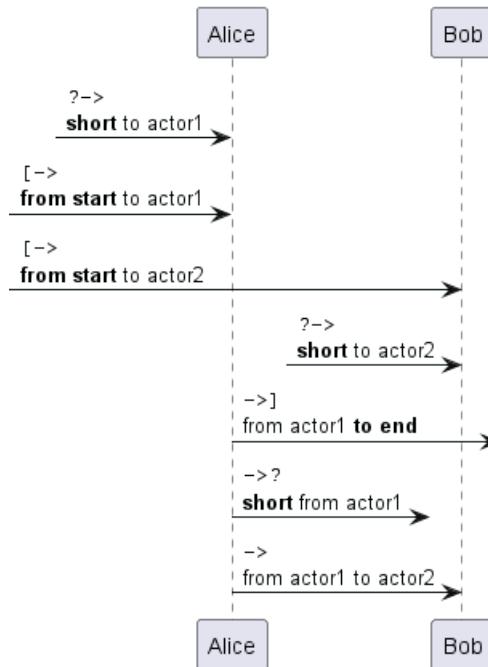
You can have **short** arrows with using ?.

```

@startuml
?-> Alice   : ""?->""\n**short** to actor1
[-> Alice   : """[->"""\n**from start** to actor1
[-> Bob     : """[->"""\n**from start** to actor2
?-> Bob     : ""?->"""\n**short** to actor2
Alice ->]   : """->]"""\nfrom actor1 **to end**
Alice ->?   : """->?"""\n**short** from actor1
Alice -> Bob : """->"""\nfrom actor1 to actor2
@enduml

```





[Ref. QA-310]

### 1.31 Anchors and Duration

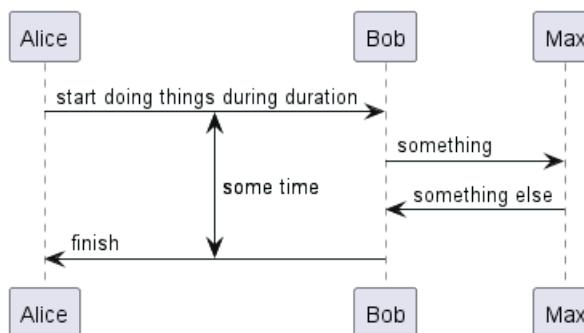
With `teoz` it is possible to add anchors to the diagram and use the anchors to specify duration time.

```
@startuml
!pragma teoz true
```

```
{start} Alice -> Bob : start doing things during duration
Bob -> Max : something
Max -> Bob : something else
{end} Bob -> Alice : finish
```

```
{start} <-> {end} : some time
```

```
@enduml
```



You can use the `-P` command-line option to specify the pragma:

```
java -jar plantuml.jar -Pteoz=true
```

[Ref. issue-582]

### 1.32 Stereotypes and Spots

It is possible to add stereotypes to participants using `<<` and `>>`.



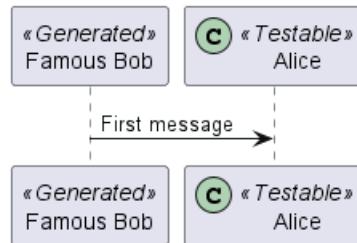
In the stereotype, you can add a spotted character in a colored circle using the syntax `(X,color)`.

```
@startuml
```

```
participant "Famous Bob" as Bob << Generated >>
participant Alice << (C,#ADD1B2) Testable >>
```

Bob->Alice: First message

```
@enduml
```



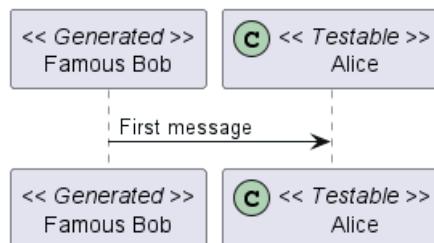
By default, the *guillemet* character is used to display the stereotype. You can change this behaviour using the skinparam `guillemet`:

```
@startuml
```

```
skinparam guillemet false
participant "Famous Bob" as Bob << Generated >>
participant Alice << (C,#ADD1B2) Testable >>
```

Bob->Alice: First message

```
@enduml
```

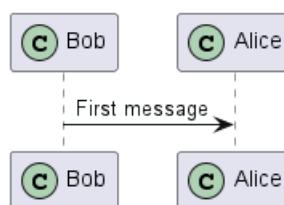


```
@startuml
```

```
participant Bob << (C,#ADD1B2) >>
participant Alice << (C,#ADD1B2) >>
```

Bob->Alice: First message

```
@enduml
```



## 1.33 More information on titles

You can use creole formatting in the title.

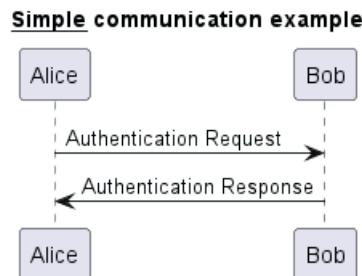


```
@startuml
```

```
title __Simple__ **communication** example
```

```
Alice -> Bob: Authentication Request
Bob -> Alice: Authentication Response
```

```
@enduml
```



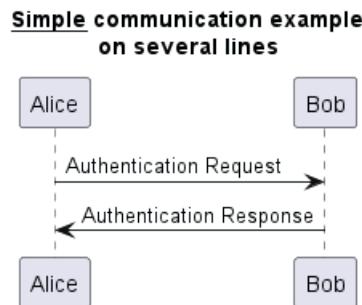
You can add newline using `\n` in the title description.

```
@startuml
```

```
title __Simple__ communication example\non several lines
```

```
Alice -> Bob: Authentication Request
Bob -> Alice: Authentication Response
```

```
@enduml
```



You can also define title on several lines using `title` and `end title` keywords.

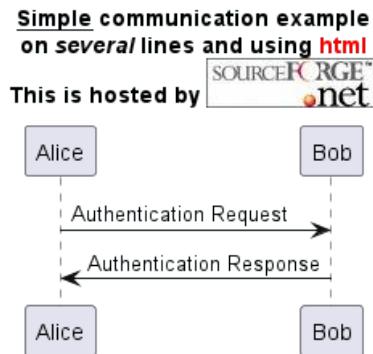
```
@startuml
```

```
title
<u>Simple</u> communication example
on <i>several</i> lines and using <font color=red>html</font>
This is hosted by <img:sourceforge.jpg>
end title
```

```
Alice -> Bob: Authentication Request
Bob -> Alice: Authentication Response
```

```
@enduml
```





### 1.34 Participants encompass

It is possible to draw a box around some participants, using `box` and `end box` commands.

You can add an optional title or a optional background color, after the `box` keyword.

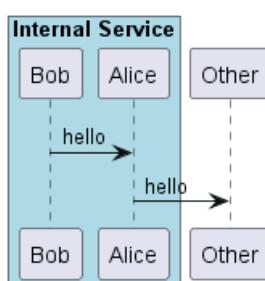
```
@startuml
```

```

box "Internal Service" #LightBlue
participant Bob
participant Alice
end box
participant Other

Bob -> Alice : hello
Alice -> Other : hello
  
```

```
@enduml
```



It is also possible to nest boxes - to draw a box within a box - when using the teoz rendering engine, for example:

```
@startuml
```

```

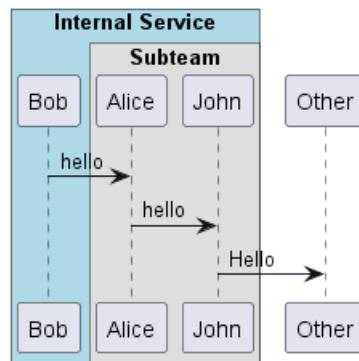
!pragma teoz true
box "Internal Service" #LightBlue
participant Bob
box "Subteam"
participant Alice
participant John
end box

end box
participant Other

Bob -> Alice : hello
Alice -> John : hello
John -> Other: Hello
  
```



```
@enduml
```



### 1.35 Removing Foot Boxes

You can use the `hide footbox` keywords to remove the foot boxes of the diagram.

```
@startuml
```

```
hide footbox
title Foot Box removed

Alice -> Bob: Authentication Request
Bob --> Alice: Authentication Response
```

```
@enduml
```



### 1.36 Skinparam

You can use the `skinparam` command to change colors and fonts for the drawing.

You can use this command:

- In the diagram definition, like any other commands,
- In an included file,
- In a configuration file, provided in the command line or the ANT task.

You can also change other rendering parameter, as seen in the following examples:

```
@startuml
skinparam sequenceArrowThickness 2
skinparam roundcorner 20
skinparam maxmessagesize 60
skinparam sequenceParticipant underline
```

```
actor User
participant "First Class" as A
participant "Second Class" as B
participant "Last Class" as C
```



```

User -> A: DoWork
activate A

A -> B: Create Request
activate B

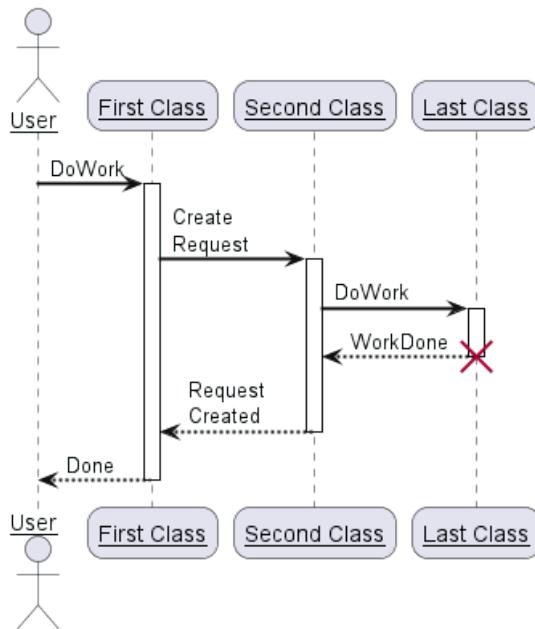
B -> C: DoWork
activate C
C --> B: WorkDone
destroy C

B --> A: Request Created
deactivate B

A --> User: Done
deactivate A

@enduml

```



```

@startuml
skinparam backgroundColor #EEEBCD
skinparam handwritten true

skinparam sequence {
ArrowColor DeepSkyBlue
ActorBorderColor DeepSkyBlue
LifeLineBorderColor blue
LifeLineBackgroundColor #A9DCDF

ParticipantBorderColor DeepSkyBlue
ParticipantBackgroundColor DodgerBlue
ParticipantFontName Impact
ParticipantFontSize 17
ParticipantFontColor #A9DCDF

ActorBackgroundColor aqua
ActorFontColor DeepSkyBlue

```



```

ActorFontSize 17
ActorFontName Aapex
}

actor User
participant "First Class" as A
participant "Second Class" as B
participant "Last Class" as C

User -> A: DoWork
activate A

A -> B: Create Request
activate B

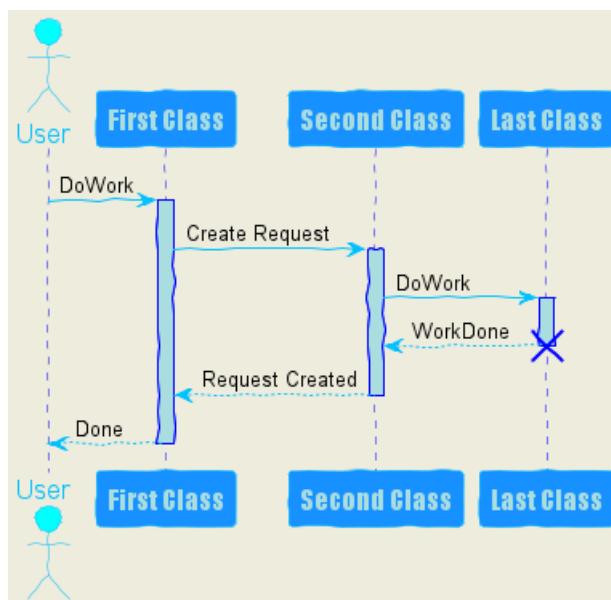
B -> C: DoWork
activate C
C --> B: WorkDone
destroy C

B --> A: Request Created
deactivate B

A --> User: Done
deactivate A

@enduml

```



## 1.37 Changing padding

It is possible to tune some padding settings.

```

@startuml
skinparam ParticipantPadding 20
skinparam BoxPadding 10

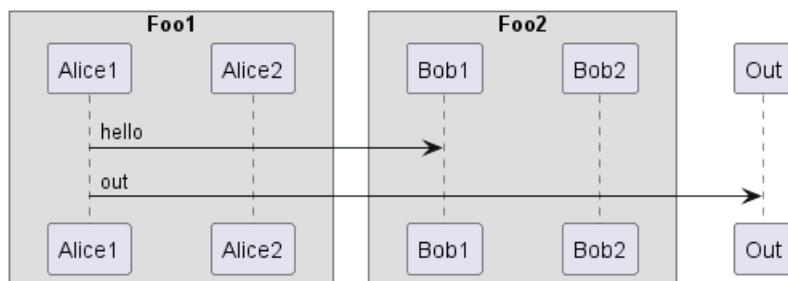
box "Foo1"
participant Alice1
participant Alice2
end box

```

```

box "Foo2"
participant Bob1
participant Bob2
end box
Alice1 -> Bob1 : hello
Alice1 -> Out : out
@enduml

```



## 1.38 Appendix: Examples of all arrow type

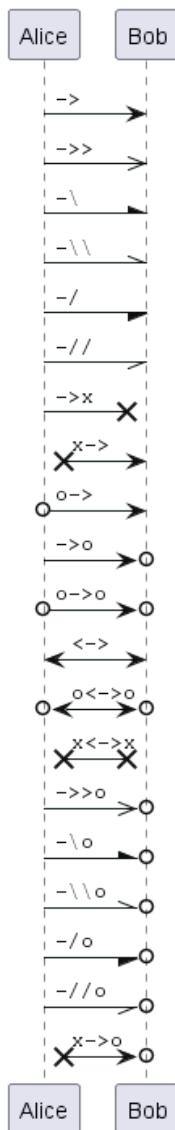
### 1.38.1 Normal arrow

```

@startuml
participant Alice as a
participant Bob as b
a -> b : ""-> ""
a ->> b : ""->> ""
a -\ b : ""-\ ""
a -\\ b : ""-\\\\\""
a -/ b : ""-/ ""
a -// b : ""-// ""
a ->x b : ""->x ""
a x-> b : ""x-> ""
a o-> b : ""o-> ""
a ->o b : ""->o ""
a o->o b : ""o->o ""
a <-> b : ""<-> ""
a o<->o b : ""o<->o""
a x<->x b : ""x<->x""
a ->>o b : ""->>o ""
a -\o b : ""-\o ""
a -\\o b : ""-\\\\o"""
a -/o b : ""-/o ""
a -//o b : ""-//o ""
a x->o b : ""x->o ""
@enduml

```



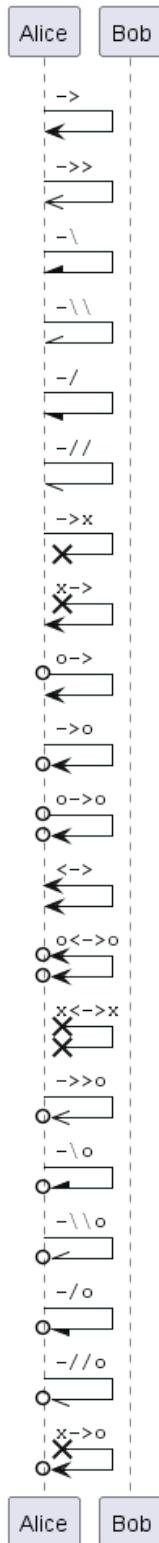


### 1.38.2 Itself arrow

```
@startuml
participant Alice as a
participant Bob as b
a -> a : ""-> ""
a ->> a : ""->> ""
a -\ a : ""-\ ""
a -\" a : ""-\\"\\\""
a -/ a : ""-/ ""
a -// a : ""-// ""
a ->x a : ""->x ""
a x-> a : ""x-> ""
a o-> a : ""o-> ""
a ->o a : ""->o ""
a o->o a : ""o->o ""
a <-> a : ""<-> ""
a o<->o a : ""o<->o ""
a x<->x a : ""x<->x ""
a ->>o a : ""->>o ""
a -\o a : ""-\o ""
a -\"o a : ""-\\"o""
```



```
a -/o      a : """-/o """
a -//o     a : """-//o """
a x->o    a : """x->o """
@enduml
```



### 1.38.3 Incoming and outgoing messages (with '[', ']')

### 1.38.4 Incoming messages (with '[')

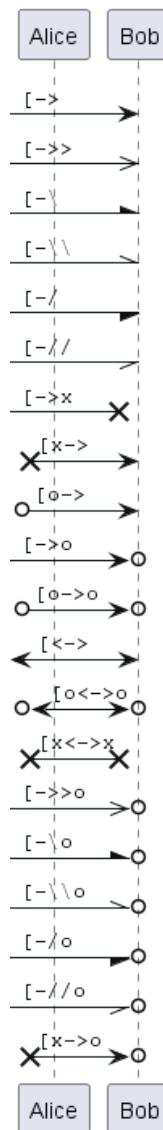
```
@startuml
```



```
participant Alice as a
participant Bob   as b
[->     b : ""[->  ""
[-->    b : ""[-->  ""
[-\    b : ""[-\   ""
[-\\ \  b : ""[-\\ \\\""
[-/    b : ""[-/   ""
[-//   b : ""[-//  ""
[->x  b : ""[->x ""
[x->  b : ""[x-> ""
[o->  b : ""[o-> ""
[->o  b : ""[->o ""
[o->o b : ""[o->o ""
[<->  b : ""[<-> ""
[o<->o b : ""[o<->o""
[x<->x b : ""[x<->x""
[-->>o b : ""[-->>o ""
[-\o   b : ""[-\o   ""
[-\\o  b : ""[-\\ \\o"""
[-/o   b : ""[-/o   ""
[-//o  b : ""[-//o  ""
[x->o b : ""[x->o ""
```

```
@enduml
```



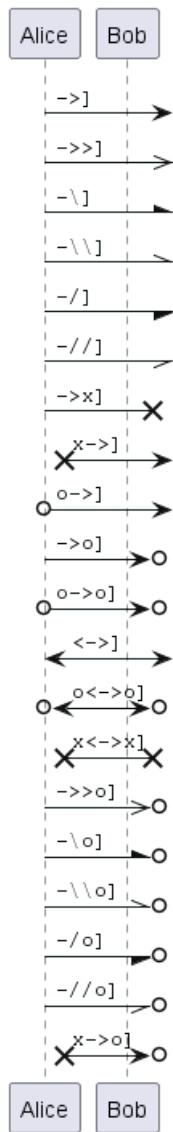


### 1.38.5 Outgoing messages (with ']')

```
@startuml
participant Alice as a
participant Bob as b
a ->] : """->]" """
a ->>] : """->>]" """
a -\] : """-\\]" """
a -\\\[ ] : """-\\\\\\]" """
a -/] : """-/]" """
a -//\[ ] : """-//]" """
a ->x] : """->x]" """
a x->] : """x->]" """
a o->] : """o->]" """
a ->o] : """->o]" """
a o->o] : """o->o]" """
a <->] : """><->]" """
a o<->o] : """o<->o]" """
a x<->x] : """x<->x]" """
a ->>o] : """->>o]" """
a -\o] : """-\\o]" """
a -\\\\o] : """-\\\\\\o]" """
```



```
a -> o]      : """->o]   """
a -//o]      : """-//o]   """
a x->o]      : """x->o]   """
@enduml
```



### 1.38.6 Short incoming and outgoing messages (with '?')

### 1.38.7 Short incoming (with '?')

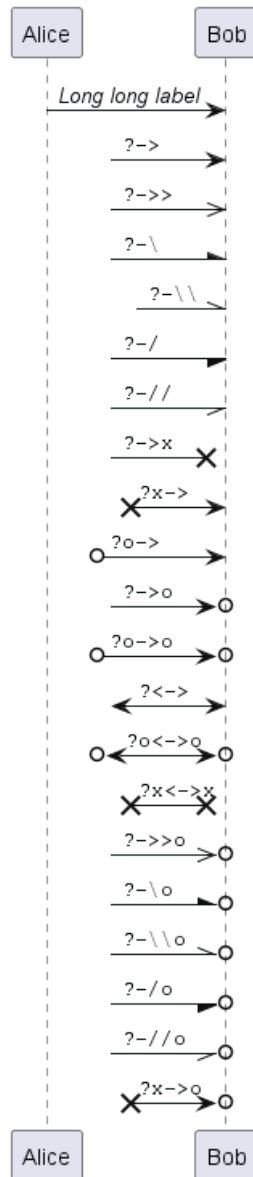
```
@startuml
participant Alice as a
participant Bob as b
a -> b : //Long long label//?
-> b : ""?->   ""
?->> b : ""?->>   ""
?-\  
 b : ""?-\  
   ""
?-\\ b : ""?-\\\\\""
?-/ b : ""?-/-   ""
?-// b : ""?-//   ""
?->x b : ""?->x   ""
?x-> b : ""?x->   ""
?o-> b : ""?o->   ""
?->o b : ""?->o   ""
```



```

?o->o    b : """?o->o """
?<->    b : """?<-> """
?o<->o  b : """?o<->o"""
?x<->x  b : """?x<->x"""
?->>o   b : """?->>o """
?-\\o    b : """?-\\o """
?-//o    b : """?-//o """
?x->o   b : """?x->o """
@enduml

```



### 1.38.8 Short outgoing (with '?')

```

@startuml
participant Alice as a
participant Bob as b
a -> b : //Long long label// 
a ->? : """->? """
a ->>? : """->>? """
a -\? : """-\? """

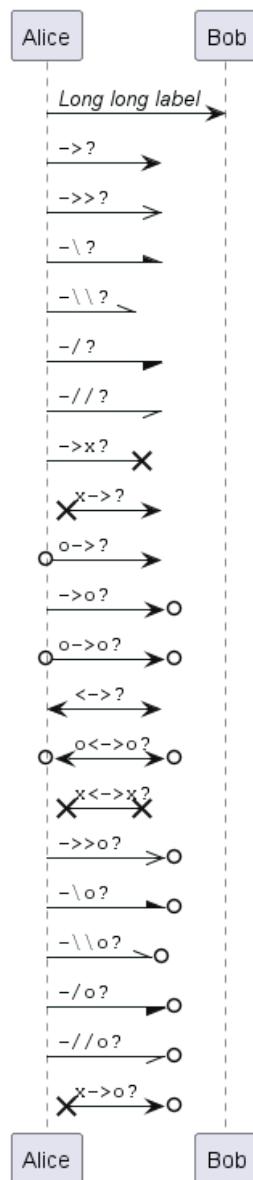
```



```

a -\?\?      : """-\\\?\?""
a -/?       : """-/?    """
a -//?      : """-//?   """
a ->x?      : """->x?   """
a x->?      : """x->?   """
a o->?      : """o->?   """
a ->o?      : """->o?   """
a o->o?     : """o->o?  """
a <->?      : """<->?  """
a o<->o?    : """o<->o?"""
a x<->x?    : """x<->x?"""
a ->>o?     : """->>o?  """
a -\o?       : """-\o?    """
a -\o?       : """-\o?    """
a -//o?      : """-//o?  """
a x->o?     : """x->o?  """
@enduml

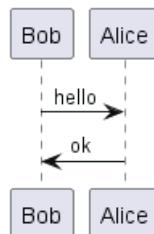
```



## 1.39 Specific SkinParameter

### 1.39.1 By default

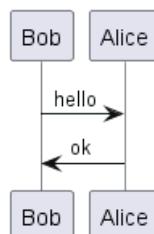
```
@startuml
Bob -> Alice : hello
Alice -> Bob : ok
@enduml
```



### 1.39.2 LifelineStrategy

- nosolid (*by default*)

```
@startuml
skinparam lifelineStrategy nosolid
Bob -> Alice : hello
Alice -> Bob : ok
@enduml
```

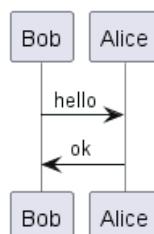


[Ref. QA-9016]

- solid

In order to have solid life line in sequence diagrams, you can use: `skinparam lifelineStrategy solid`

```
@startuml
skinparam lifelineStrategy solid
Bob -> Alice : hello
Alice -> Bob : ok
@enduml
```



[Ref. QA-2794]

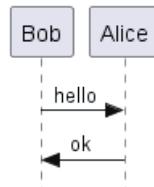
### 1.39.3 style strictuml

To be conform to strict UML (*for arrow style: emits triangle rather than sharp arrowheads*), you can use:

- `skinparam style strictuml`



```
@startuml
skinparam style strictuml
Bob -> Alice : hello
Alice -> Bob : ok
@enduml
```



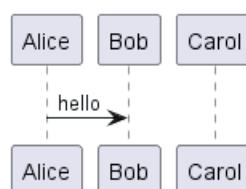
[Ref. QA-1047]

## 1.40 Hide unlinked participant

By default, all participants are displayed.

```
@startuml
participant Alice
participant Bob
participant Carol

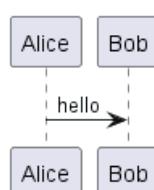
Alice -> Bob : hello
@enduml
```



But you can hide unlinked participant.

```
@startuml
hide unlinked
participant Alice
participant Bob
participant Carol

Alice -> Bob : hello
@enduml
```



[Ref. QA-4247]

## 1.41 Color a group message

It is possible to color a group messages:

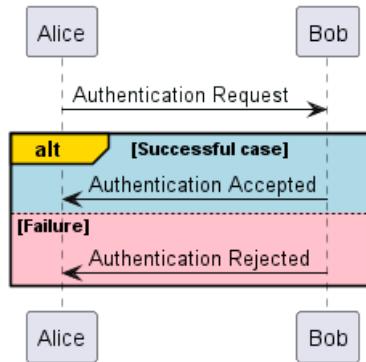
```
@startuml
Alice -> Bob: Authentication Request
alt#Gold #LightBlue Successful case
    Bob -> Alice: Authentication Accepted
```



```

else #Pink Failure
    Bob -> Alice: Authentication Rejected
end
@enduml

```



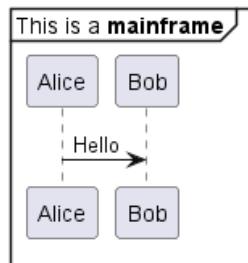
[Ref. QA-4750 and QA-6410]

## 1.42 Mainframe

```

@startuml
mainframe This is a **mainframe**
Alice->Bob : Hello
@enduml

```



[Ref. QA-4019 and Issue#148]

## 1.43 Slanted or odd arrows

You can use the `(nn)` option (before or after arrow) to make the arrows slanted, where `nn` is the number of shift pixels.

*[Available only after v1.2022.6beta+]*

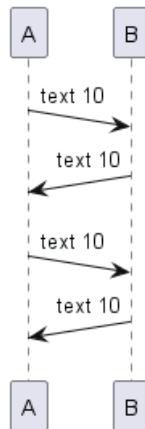
```

@startuml
A ->(10) B: text 10
B ->(10) A: text 10

A ->(10) B: text 10
A (10)<- B: text 10
@enduml

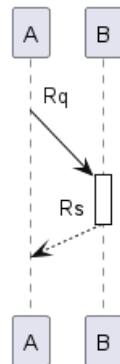
```





```

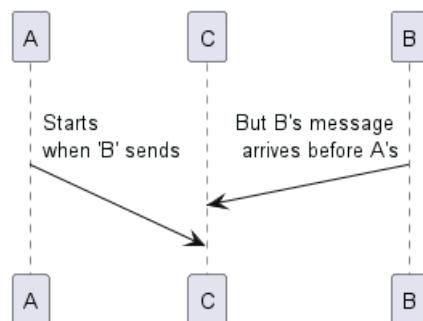
@startuml
A ->(40) B++: Rq
B -->(20) A--: Rs
@enduml
  
```



[Ref. QA-14145]

```

@startuml
!pragma teoz true
A ->(50) C: Starts\nwhen 'B' sends
& B ->(25) C: \nBut B's message\n arrives before A's
@enduml
  
```



[Ref. QA-6684]

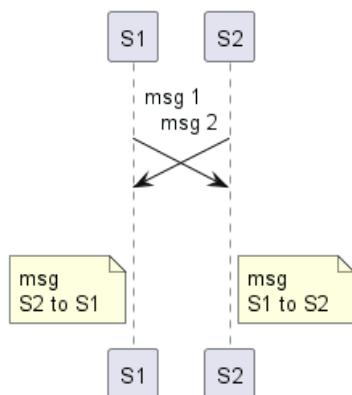
```

@startuml
!pragma teoz true

S1 ->(30) S2: msg 1\n
& S2 ->(30) S1: msg 2

note left S1: msg\nS2 to S1
& note right S2: msg\nS1 to S2
  
```

```
@enduml
```



[Ref. QA-1072]



## 2 Use Case Diagram

A **use case diagram** is a visual representation used in software engineering to depict the interactions between **system actors** and the **system itself**. It captures the dynamic behavior of a system by illustrating its **use cases** and the roles that interact with them. These diagrams are essential in specifying the system's **functional requirements** and understanding how users will interact with the system. By providing a high-level view, use case diagrams help stakeholders understand the system's functionality and its potential value.

**PlantUML** offers a unique approach to creating use case diagrams through its text-based language. One of the primary advantages of using PlantUML is its **simplicity and efficiency**. Instead of manually drawing shapes and connections, users can define their diagrams using intuitive and concise textual descriptions. This not only speeds up the diagram creation process but also ensures **consistency and accuracy**. The ability to integrate with various documentation platforms and its wide range of supported output formats make PlantUML a versatile tool for both developers and non-developers. Lastly, being **open-source**, PlantUML boasts a strong community that continually contributes to its improvement and offers a wealth of resources for users at all levels.

### 2.1 Usecases

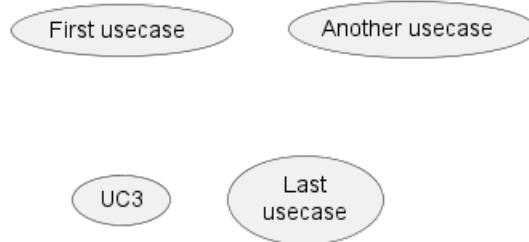
Use cases are enclosed using between parentheses (because two parentheses looks like an oval).

You can also use the **usecase** keyword to define a usecase. And you can define an alias, using the **as** keyword. This alias will be used later, when defining relations.

```
@startuml
```

```
(First usecase)
(Another usecase) as (UC2)
usecase UC3
usecase (Last\nusecase) as UC4
```

```
@enduml
```



### 2.2 Actors

The name defining an actor is enclosed between colons.

You can also use the **actor** keyword to define an actor. An alias can be assigned using the **as** keyword and can be used later instead of the actor's name, e. g. when defining relations.

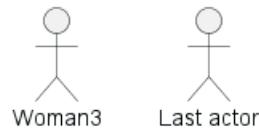
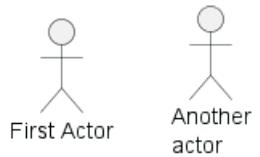
You can see from the following examples, that the actor definitions are optional.

```
@startuml
```

```
:First Actor:
:Another\name: as Man2
actor Woman3
actor :Last actor: as Person1
```

```
@enduml
```





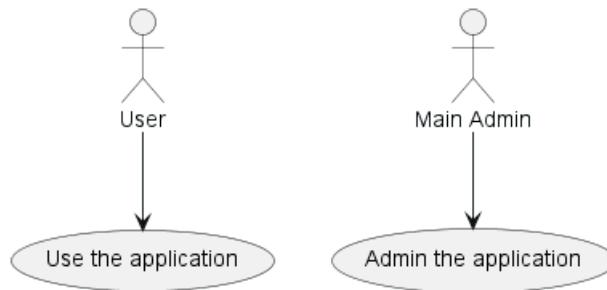
## 2.3 Change Actor style

You can change the actor style from stick man (*by default*) to:

- an awesome man with the `skinparam actorStyle awesome` command;
- a hollow man with the `skinparam actorStyle hollow` command.

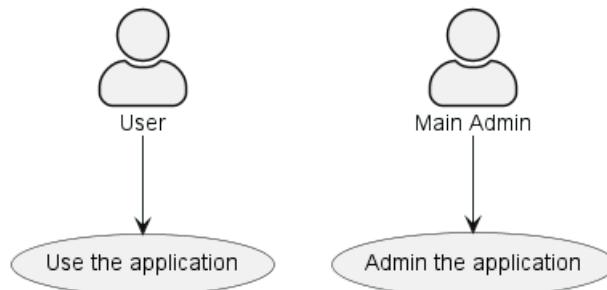
### 2.3.1 Stick man (*by default*)

```
@startuml
:User: --> (Use)
"Main Admin" as Admin
"Use the application" as (Use)
Admin --> (Admin the application)
@enduml
```



### 2.3.2 Awesome man

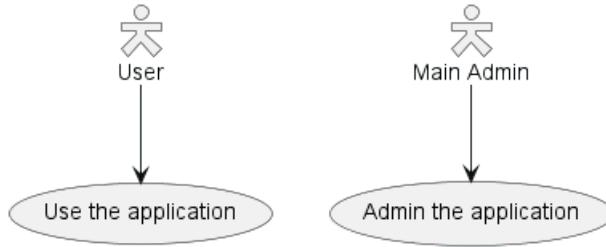
```
@startuml
skinparam actorStyle awesome
:User: --> (Use)
"Main Admin" as Admin
"Use the application" as (Use)
Admin --> (Admin the application)
@enduml
```



[Ref. QA-10493]

### 2.3.3 Hollow man

```
@startuml
skinparam actorStyle Hollow
:User: --> (Use)
"Main Admin" as Admin
"Use the application" as (Use)
Admin --> (Admin the application)
@enduml
```



[Ref. PR#396]

## 2.4 Usecases description

If you want to have a description spanning several lines, you can use quotes.

You can also use the following separators:

- -- (dashes)
- .. (periods)
- == (equals)
- \_\_ (underscores)

By using them pairwise and enclosing text between them, you can create separators with titles.

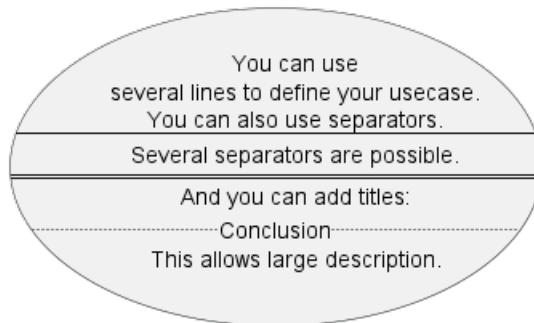
```
@startuml
```

```
usecase UC1 as "You can use
several lines to define your usecase.
You can also use separators.

-- 
Several separators are possible.

== 
And you can add titles:
..Conclusion..
This allows large description."
```

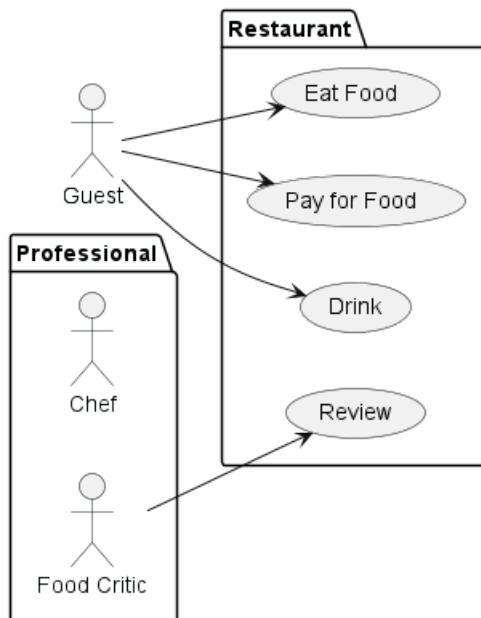
```
@enduml
```



## 2.5 Use package

You can use packages to group actors or use cases.

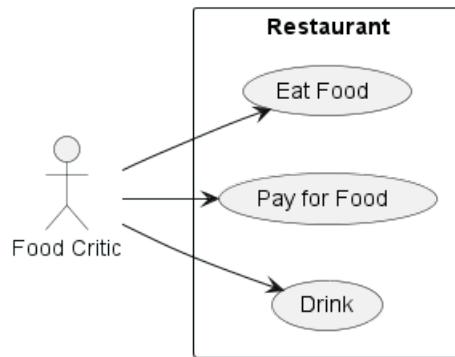
```
@startuml
left to right direction
actor Guest as g
package Professional {
    actor Chef as c
    actor "Food Critic" as fc
}
package Restaurant {
    usecase "Eat Food" as UC1
    usecase "Pay for Food" as UC2
    usecase "Drink" as UC3
    usecase "Review" as UC4
}
fc --> UC4
g --> UC1
g --> UC2
g --> UC3
@genduml
```



You can use `rectangle` to change the display of the package.

```
@startuml
left to right direction
actor "Food Critic" as fc
rectangle Restaurant {
    usecase "Eat Food" as UC1
    usecase "Pay for Food" as UC2
    usecase "Drink" as UC3
}
fc --> UC1
fc --> UC2
fc --> UC3
@genduml
```





## 2.6 Basic example

To link actors and use cases, the arrow `-->` is used.

The more dashes – in the arrow, the longer the arrow. You can add a label on the arrow, by adding a `:` character in the arrow definition.

In this example, you see that `User` has not been defined before, and is used as an actor.

`@startuml`

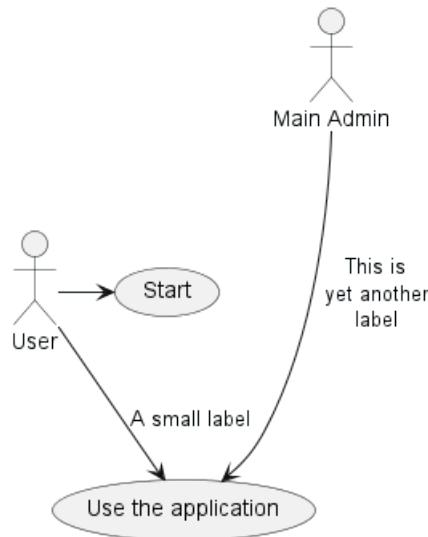
```

User -> (Start)
User --> (Use the application) : A small label

:Main Admin: ---> (Use the application) : This is\nyet another\nlabel

```

`@enduml`



## 2.7 Extension

If one actor/use case extends another one, you can use the symbol `<|--`.

```

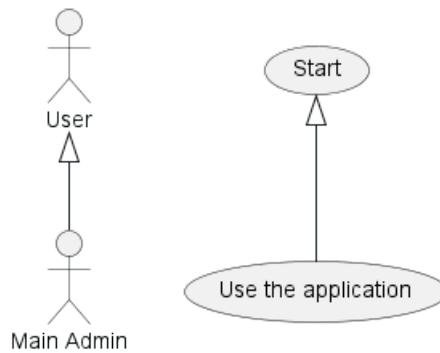
@startuml
:Main Admin: as Admin
(Use the application) as (Use)

User <|-- Admin
(Start) <|-- (Use)

@enduml

```

`@enduml`



## 2.8 Using notes

You can use the `note left of` , `note right of` , `note top of` , `note bottom of` keywords to define notes related to a single object.

A note can be also define alone with the `note` keywords, then linked to other objects using the `..` symbol.

```
@startuml
:Main Admin: as Admin
(Use the application) as (Use)
```

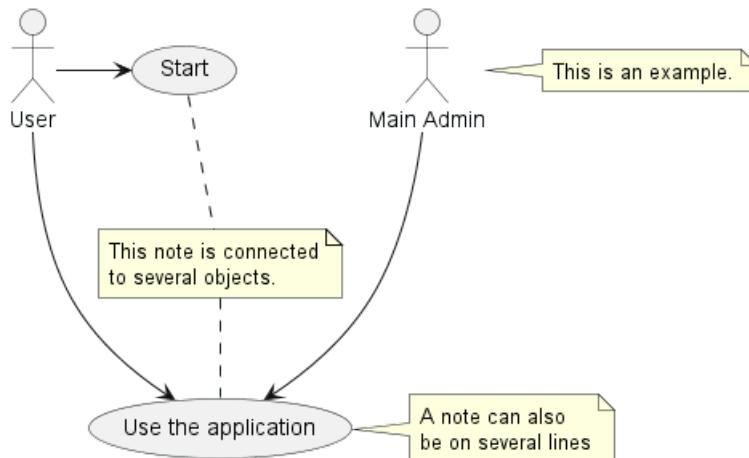
```
User -> (Start)
User --> (Use)
```

```
Admin ---> (Use)
```

```
note right of Admin : This is an example.
```

```
note right of (Use)
A note can also
be on several lines
end note
```

```
note "This note is connected\n to several objects." as N2
(Start) .. N2
N2 .. (Use)
@enduml
```



## 2.9 Stereotypes

You can add stereotypes while defining actors and use cases using `<<` and `>>`.



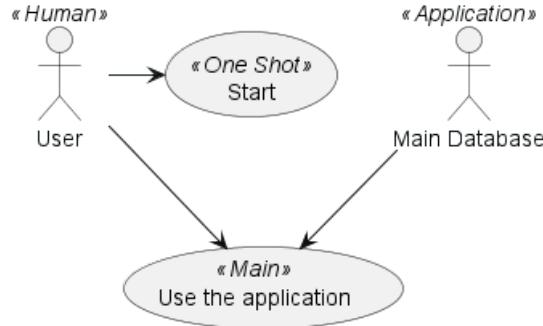
```
@startuml
User << Human >>
:Main Database: as MySql << Application >>
(Start) << One Shot >>
(Use the application) as (Use) << Main >>
```

User -> (Start)

User --> (Use)

MySql --> (Use)

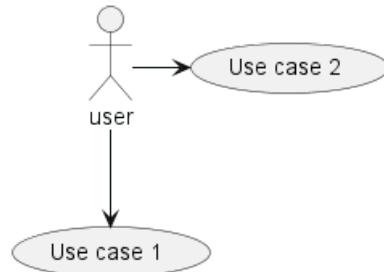
@enduml



## 2.10 Changing arrows direction

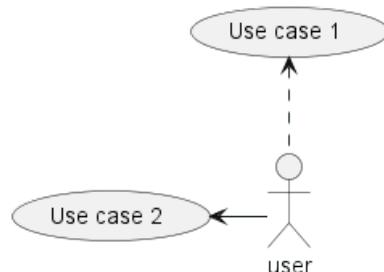
By default, links between classes have two dashes -- and are vertically oriented. It is possible to use horizontal link by putting a single dash (or dot) like this:

```
@startuml
:user: --> (Use case 1)
:user: -> (Use case 2)
@enduml
```



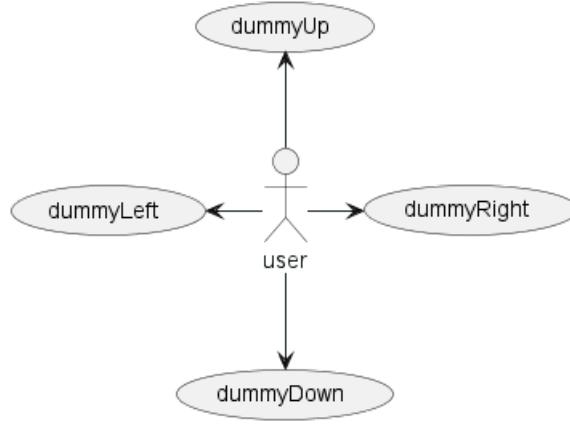
You can also change directions by reversing the link:

```
@startuml
(Use case 1) <.. :user:
(Use case 2) <- :user:
@enduml
```



It is also possible to change arrow direction by adding `left`, `right`, `up` or `down` keywords inside the arrow:

```
@startuml
:user: -left-> (dummyLeft)
:user: -right-> (dummyRight)
:user: -up-> (dummyUp)
:user: -down-> (dummyDown)
@enduml
```

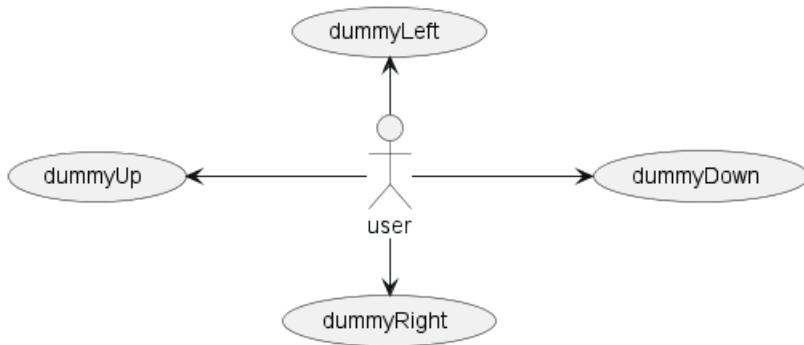


You can shorten the arrow by using only the first character of the direction (for example, `-d-` instead of `-down-`) or the two first characters (`-do-`).

Please note that you should not abuse this functionality : *Graphviz* gives usually good results without tweaking.

And with the `left to right direction` parameter:

```
@startuml
left to right direction
:user: -left-> (dummyLeft)
:user: -right-> (dummyRight)
:user: -up-> (dummyUp)
:user: -down-> (dummyDown)
@enduml
```

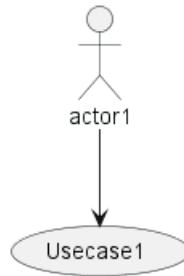


## 2.11 Splitting diagrams

The `newpage` keyword to split your diagram into several pages or images.

```
@startuml
:actor1: --> (Usecase1)
newpage
:actor2: --> (Usecase2)
@enduml
```





## 2.12 Left to right direction

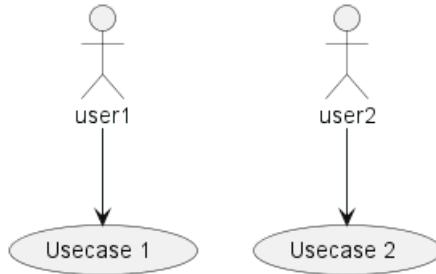
The general default behavior when building diagram is **top to bottom**.

```

@startuml
'default
top to bottom direction
user1 --> (Usecase 1)
user2 --> (Usecase 2)

@enduml

```



You may change to **left to right** using the **left to right direction** command. The result is often better with this direction.

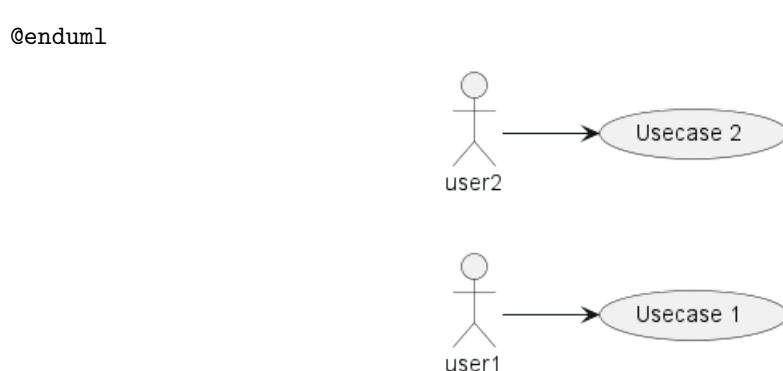
```

@startuml

left to right direction
user1 --> (Usecase 1)
user2 --> (Usecase 2)

@enduml

```



## 2.13 Skinparam

You can use the **skinparam** command to change colors and fonts for the drawing.

You can use this command :

- In the diagram definition, like any other commands,



- In an included file,
- In a configuration file, provided in the command line or the ANT task.

You can define specific color and fonts for stereotyped actors and usecases.

```
@startuml
skinparam handwritten true

skinparam usecase {
BackgroundColor DarkSeaGreen
BorderColor DarkSlateGray

BackgroundColor<< Main >> YellowGreen
BorderColor<< Main >> YellowGreen

ArrowColor Olive
ActorBorderColor black
ActorFontName Courier

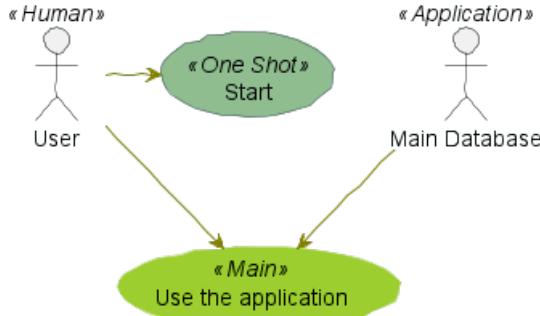
ActorBackgroundColor<< Human >> Gold
}

User << Human >>
:Main Database: as MySql << Application >>
(Start) << One Shot >>
(Use the application) as (Use) << Main >>

User -> (Start)
User --> (Use)

MySql --> (Use)

@enduml
```

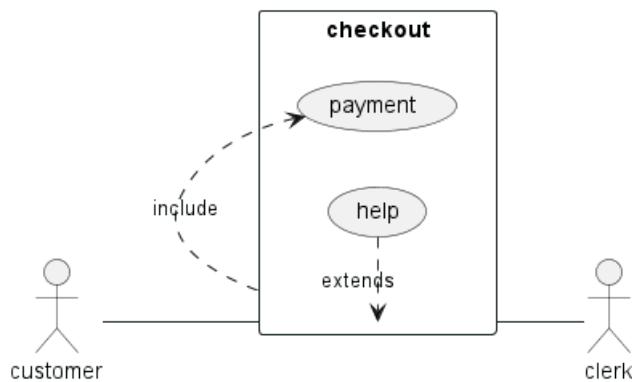


## 2.14 Complete example

```
@startuml
left to right direction
skinparam packageStyle rectangle
actor customer
actor clerk
rectangle checkout {
    customer -- (checkout)
    (checkout) .> (payment) : include
    (help) .> (checkout) : extends
    (checkout) -- clerk
}
```



@enduml



## 2.15 Business Use Case

You can add / to make Business Use Case.

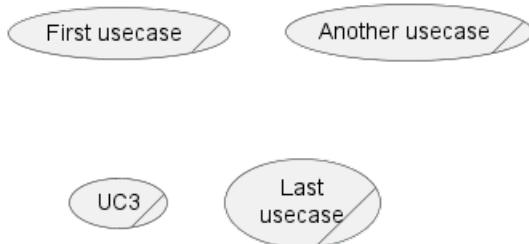
### 2.15.1 Business Usecase

@startuml

```

(First usecase) /
(Another usecase) / as (UC2)
usecase/ UC3
usecase/ (Last\usecase) as UC4
  
```

@enduml



### 2.15.2 Business Actor

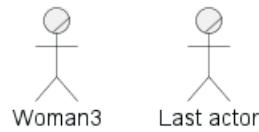
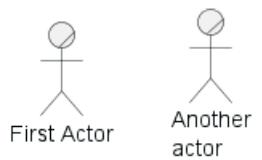
@startuml

```

:First Actor:/
:Another\actor:/ as Man2
actor/ Woman3
actor/ :Last actor: as Person1
  
```

@enduml





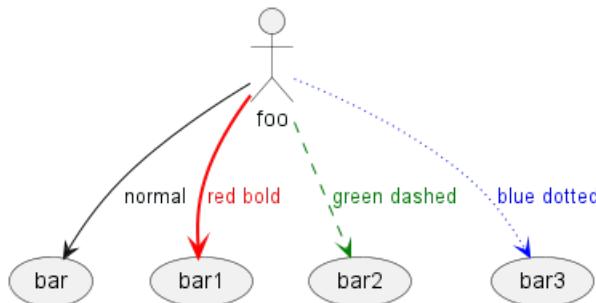
[Ref. QA-12179]

## 2.16 Change arrow color and style (inline style)

You can change the color or style of individual arrows using the inline following notation:

- #color;line.[bold|dashed|dotted];text:color

```
@startuml
actor foo
foo --> (bar) : normal
foo --> (bar1) #line:red;line.bold;text:red : red bold
foo --> (bar2) #green;line.dashed;text:green : green dashed
foo --> (bar3) #blue;line.dotted;text:blue : blue dotted
@enduml
```



[Ref. QA-3770 and QA-3816] [See similar feature on deployment-diagram or class diagram]

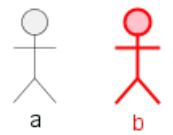
## 2.17 Change element color and style (inline style)

You can change the color or style of individual element using the following notation:

- #[color|back:color];line:color;line.[bold|dashed|dotted];text:color

```
@startuml
actor a
actor b #pink;line:red;line.bold;text:red
usecase c #palegreen;line:green;line.dashed;text:green
usecase d #aliceblue;line:blue;line.dotted;text:blue
@enduml
```





[Ref. QA-5340 and adapted from QA-6852]

## 2.18 Display JSON Data on Usecase diagram

### 2.18.1 Simple example

```
@startuml
allowmixing

actor      Actor
usecase    Usecase
```

```
json JSON {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml
```



JSON	
fruit	Apple
size	Large
color	Red
	Green

[Ref. QA-15481]

For another example, see on JSON page.



## 3 Class Diagram

Class diagrams are designed using a syntax that mirrors those traditionally employed in programming languages. This resemblance fosters a familiar environment for developers, thereby facilitating an easier and more intuitive diagram creation process.

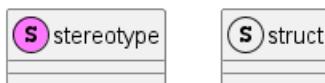
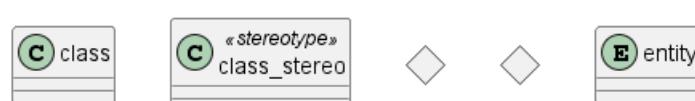
This design approach is not only succinct but also enables the creation of representations that are both concise and expressive. Moreover, it allows for the portrayal of relationships between classes through a syntax that echoes that of sequence diagrams, paving the way for a fluid and insightful depiction of class interactions.

Beyond structural and relational representations, the class diagram syntax supports further enrichments such as the inclusion of notes and the application of colors, empowering users to create diagrams that are both informative and visually appealing.

You can learn more about some of the common commands in PlantUML to enhance your diagram creation experience.

### 3.1 Declaring element

```
@startuml
abstract      abstract
abstract class "abstract class"
annotation    annotation
circle        circle
()            circle_short_form
class         class
class         class_stereo  <<stereotype>>
diamond       diamond
<>           diamond_short_form
entity        entity
enum          enum
exception     exception
interface     interface
metaclass    metaclass
protocol      protocol
stereotype   stereotype
struct        struct
@enduml
```



[Ref. for protocol and struct: GH-1028, for exception: QA-16258]

## 3.2 Relations between classes

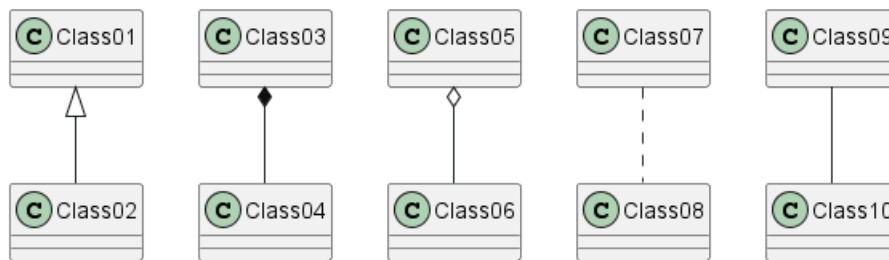
Relations between classes are defined using the following symbols :

Type	Symbol	Drawing
Extension	< --	
Composition	*--	
Aggregation	o--	

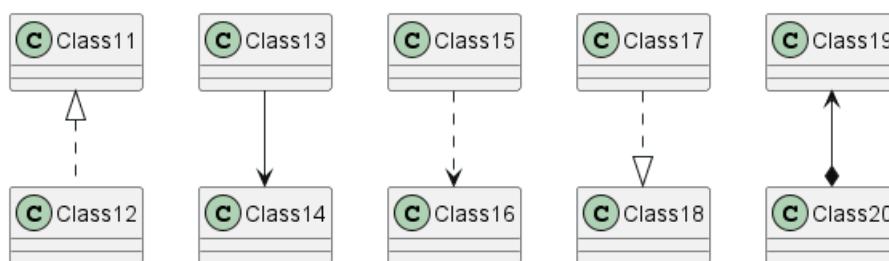
It is possible to replace -- by .. to have a dotted line.

Knowing those rules, it is possible to draw the following drawings:

```
@startuml
Class01 <|-- Class02
Class03 *-- Class04
Class05 o-- Class06
Class07 .. Class08
Class09 -- Class10
@enduml
```

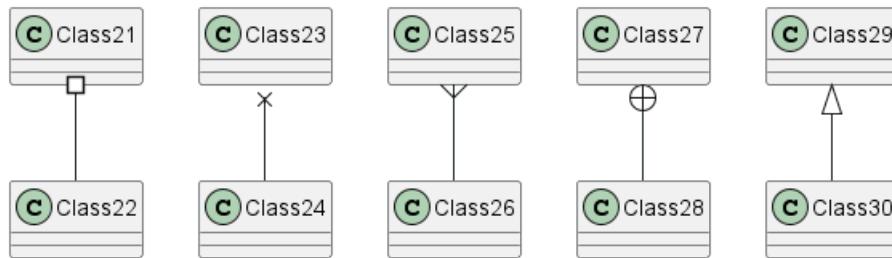


```
@startuml
Class11 <|.. Class12
Class13 --> Class14
Class15 ..> Class16
Class17 ..|> Class18
Class19 <--* Class20
@enduml
```



```
@startuml
Class21 #--- Class22
Class23 x--- Class24
Class25 }--- Class26
Class27 +--- Class28
Class29 ^--- Class30
@enduml
```





### 3.3 Label on relations

It is possible to add a label on the relation, using `:`, followed by the text of the label.

For cardinality, you can use double-quotes `"1"` or `"many"` on each side of the relation.

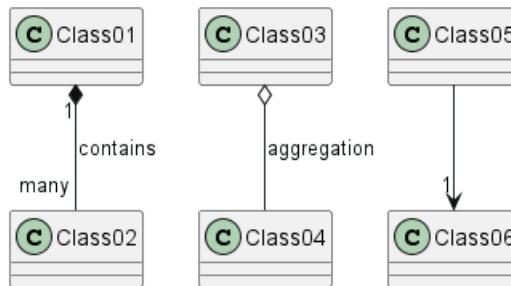
```
@startuml
```

```
Class01 "1" *-- "many" Class02 : contains
```

```
Class03 o-- Class04 : aggregation
```

```
Class05 --> "1" Class06
```

```
@enduml
```

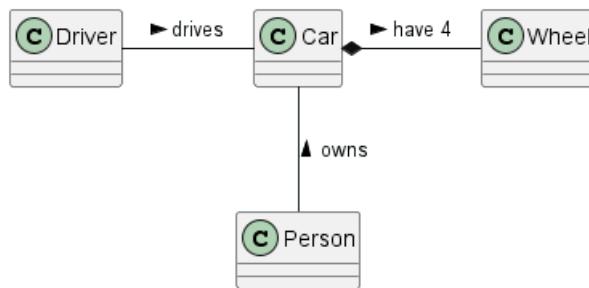


You can add an extra arrow pointing at one object showing which object acts on the other object, using `<` or `>` at the begin or at the end of the label.

```
@startuml
class Car
```

```
Driver - Car : drives >
Car *-- Wheel : have 4 >
Car -- Person : < owns
```

```
@enduml
```



### 3.4 Using non-letters in element names and relation labels

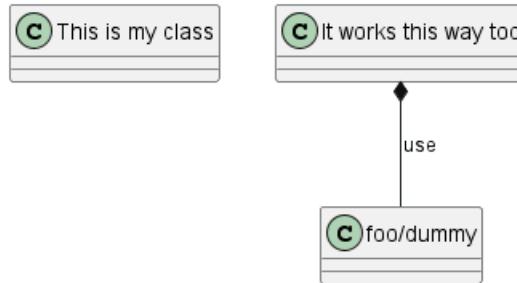
If you want to use non-letters in the class (or enum...) display name, you can either :



- Use the `as` keyword in the class definition to assign an alias
- Put quotes "" around the class name

```
@startuml
class "This is my class" as class1
class class2 as "It works this way too"

class2 *-- "foo/dummy" : use
@enduml
```



If an alias is assigned to an element, the rest of the file must refer to the element by the alias instead of the name.

### 3.4.1 Starting names with \$

Note that names starting with \$ cannot be hidden or removed later, because `hide` and `remove` command will consider the name a `$tag` instead of a component name. To later remove such elements they must have an alias or must be tagged.

```
@startuml
class $C1
class $C2 $C2
class "$C2" as dollarC2
remove $C1
remove $C2
remove dollarC2
@enduml
```



Also note that names starting with \$ are valid, but to assign an alias to such element the name must be put between quotes "".

## 3.5 Adding methods

To declare fields and methods, you can use the symbol `:` followed by the field's or method's name.

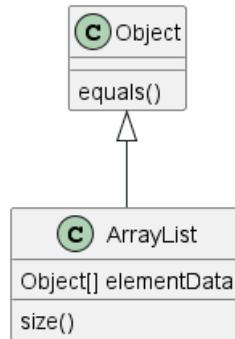
The system checks for parenthesis to choose between methods and fields.

```
@startuml
Object <|-- ArrayList

Object : equals()
ArrayList : Object[] elementData
ArrayList : size()

@enduml
```





It is also possible to group between brackets {} all fields and methods.

Note that the syntax is highly flexible about type/name order.

```

@startuml
class Dummy {
    String data
    void methods()
}

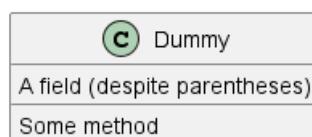
class Flight {
    flightNumber : Integer
    departureTime : Date
}
@enduml
  
```



You can use {field} and {method} modifiers to override default behaviour of the parser about fields and methods.

```

@startuml
class Dummy {
    {field} A field (despite parentheses)
    {method} Some method
}
@enduml
  
```



## 3.6 Defining visibility

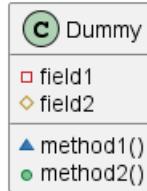
When you define methods or fields, you can use characters to define the visibility of the corresponding item:

Character	Icon for field	Icon for method	Visibility
-	□	■	private
#	◊	◊	protected
~	△	△	package private
+	○	●	public

@startuml

```
class Dummy {
    -field1
    #field2
    ~method1()
    +method2()
}

@enduml
```



You can turn off this feature using the `skinparam classAttributeIconSize 0` command :

```
@startuml
skinparam classAttributeIconSize 0
class Dummy {
    -field1
    #field2
    ~method1()
    +method2()
}

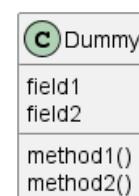
@enduml
```



Visibility indicators are optional and can be omitted individually without turning off the icons globally using `skinparam classAttributeIconSize 0`.

```
@startuml
class Dummy {
    field1
    field2
    method1()
    method2()
}

@enduml
```



In such case if you'd like to use methods or fields that start with -, #, ~ or + characters such as a destructor in some languages for `Dummy` class (), escape the first character with a \ character:



```
@startuml
class Dummy {
    field1
    \~Dummy()
    method1()
}

@enduml
```

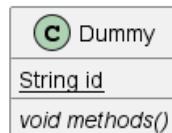


### 3.7 Abstract and Static

You can define static or abstract methods or fields using the `{static}` or `{abstract}` modifier.

These modifiers can be used at the start or at the end of the line. You can also use `{classifier}` instead of `{static}`.

```
@startuml
class Dummy {
    {static} String id
    {abstract} void methods()
}
@enduml
```



### 3.8 Advanced class body

By default, methods and fields are automatically regrouped by PlantUML. You can use separators to define your own way of ordering fields and methods. The following separators are possible : `-- .. == _`.

You can also use titles within the separators:

```
@startuml
class Foo1 {
    You can use
    several lines
    ..
    as you want
    and group
    ==
    things together.

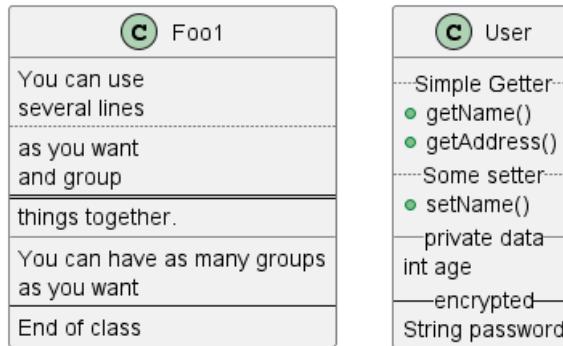
    --
    You can have as many groups
    as you want
    --
    End of class
}

class User {
    .. Simple Getter ..
```



```
+ getName()
+ getAddress()
... Some setter ...
+ setName()
-- private data --
int age
-- encrypted --
String password
}
```

@enduml



### 3.9 Notes and stereotypes

Stereotypes are defined with the `class` keyword, `<>` and `>>`.

You can also define notes using `note left of`, `note right of`, `note top of`, `note bottom of` keywords.

You can also define a note on the last defined class using `note left`, `note right`, `note top`, `note bottom`.

A note can be also define alone with the `note` keywords, then linked to other objects using the `..` symbol.

```
@startuml
class Object << general >>
Object <|-- ArrayList

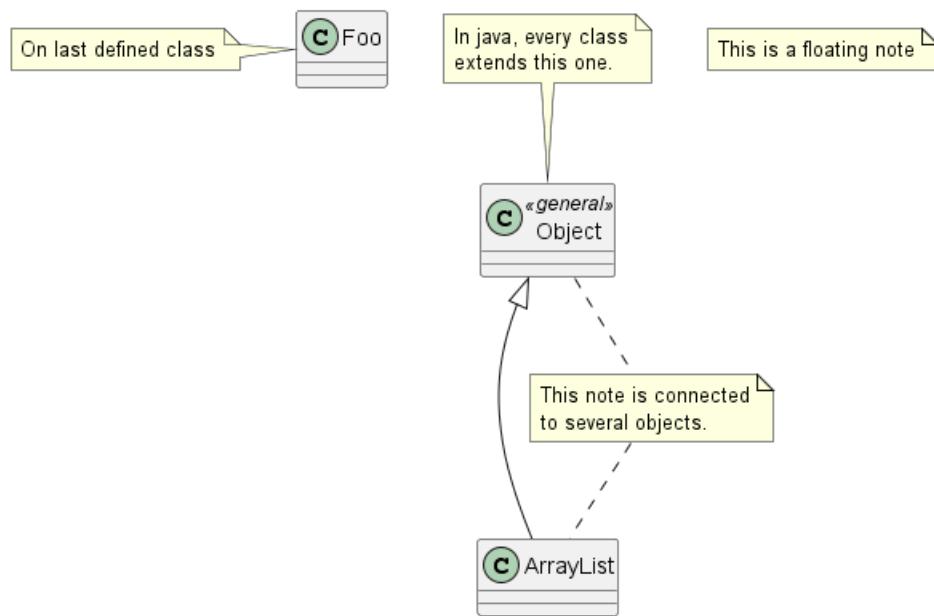
note top of Object : In java, every class\nextends this one.

note "This is a floating note" as N1
note "This note is connected\nto several objects." as N2
Object .. N2
N2 .. ArrayList

class Foo
note left: On last defined class

@enduml
```





### 3.10 More on notes

It is also possible to use few HTML tags (See Creole expression) like :

- <b>
- <u>
- <i>
- <s>, <del>, <strike>
- <font color="#AAAAAA"> or <font color="colorName">
- <color:#AAAAAA> or <color:colorName>
- <size:nn> to change font size
-  or <img:file>: the file must be accessible by the filesystem

You can also have a note on several lines.

You can also define a note on the last defined class using `note left`, `note right`, `note top`, `note bottom`.

`@startuml`

```

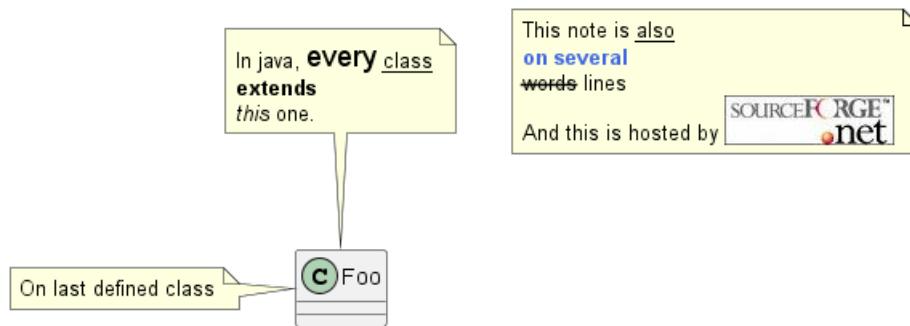
class Foo
note left: On last defined class

note top of Foo
  In java, <size:18>every</size> <u>class</u>
  <b>extends</b>
  <i>this</i> one.
end note

note as N1
  This note is <u>also</u>
  <b><color:royalBlue>on several</color>
  <s>words</s> lines
  And this is hosted by <img:sourceforge.jpg>
end note
  
```



```
@enduml
```



### 3.11 Note on field (field, attribute, member) or method

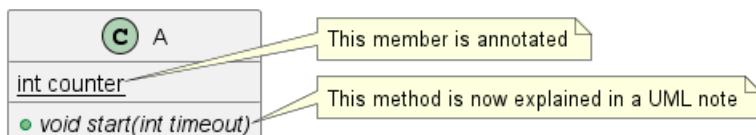
It is possible to add a note on field (field, attribute, member) or on method.

#### 3.11.1 Constraint

- This cannot be used with top or bottom (*only left and right are implemented*)
- This cannot be used with namespaceSeparator ::

#### 3.11.2 Note on field or method

```
@startuml
class A {
{static} int counter
+void {abstract} start(int timeout)
}
note right of A::counter
    This member is annotated
end note
note right of A::start
    This method is now explained in a UML note
end note
@enduml
```

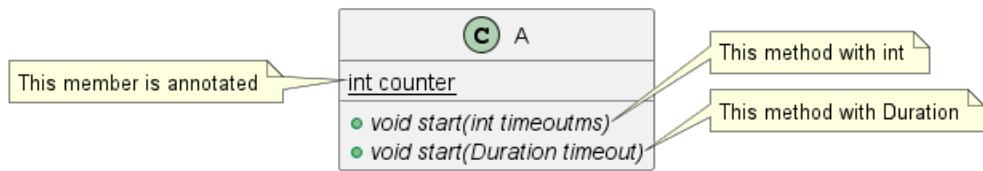


#### 3.11.3 Note on method with the same name

```
@startuml
class A {
{static} int counter
+void {abstract} start(int timeoutms)
+void {abstract} start(Duration timeout)
}
note left of A::counter
    This member is annotated
end note
note right of A::"start(int timeoutms)"
    This method with int
end note
note right of A::"start(Duration timeout)"
    This method with Duration
@enduml
```



```
end note
@enduml
```



[Ref. QA-3474 and QA-5835]

### 3.12 Note on links

It is possible to add a note on a link, just after the link definition, using `note on link`.

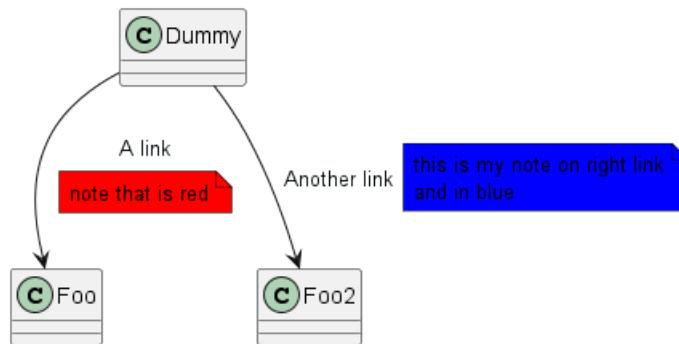
You can also use `note left on link`, `note right on link`, `note top on link`, `note bottom on link` if you want to change the relative position of the note with the label.

```
@startuml
```

```
class Dummy
Dummy --> Foo : A link
note on link #red: note that is red

Dummy --> Foo2 : Another link
note right on link #blue
this is my note on right link
and in blue
end note
```

```
@enduml
```



### 3.13 Abstract class and interface

You can declare a class as abstract using `abstract` or `abstract class` keywords.

The class will be printed in *italic*.

You can use the `interface`, `annotation` and `enum` keywords too.

```
@startuml
```

```
abstract class AbstractList
abstract AbstractCollection
interface List
interface Collection

List <|-- AbstractList
Collection <|-- AbstractCollection
```



```
Collection <|- List
AbstractCollection <|- AbstractList
AbstractList <|-- ArrayList
```

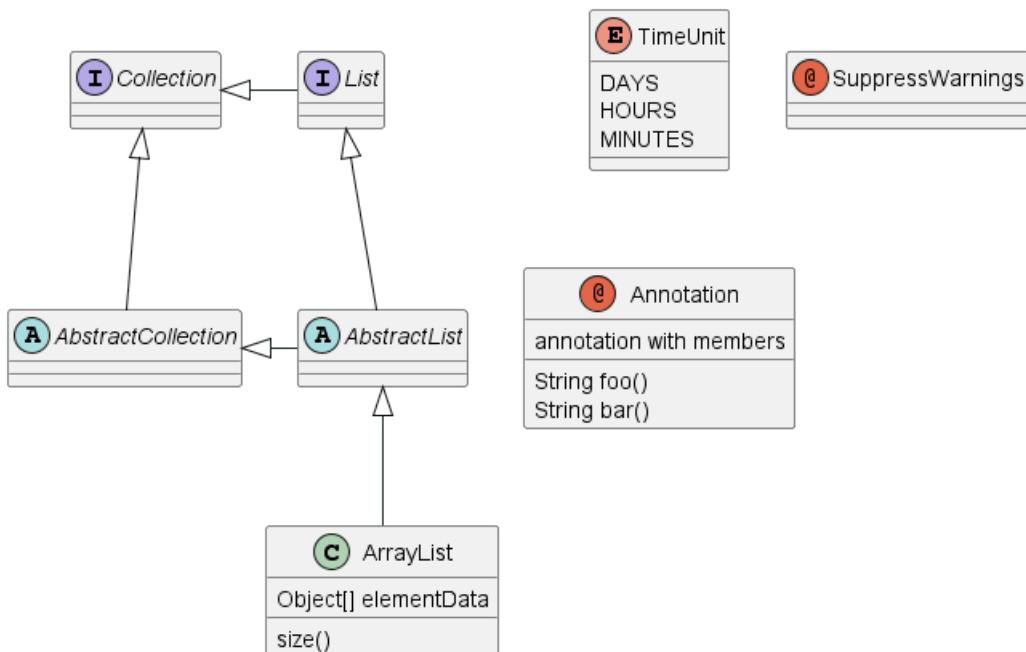
```
class ArrayList {
    Object[] elementData
    size()
}

enum TimeUnit {
    DAYS
    HOURS
    MINUTES
}

annotation SuppressWarnings
```

annotation Annotation {
 annotation with members
 String foo()
 String bar()
}

@enduml



[Ref. 'Annotation with members' Issue#458]

### 3.14 Hide attributes, methods...

You can parameterize the display of classes using the `hide/show` command.

The basic command is: `hide empty members`. This command will hide attributes or methods if they are empty.

Instead of `empty members`, you can use:

- `empty fields` or `empty attributes` for empty fields,



- **empty methods** for empty methods,
- **fields or attributes** which will hide fields, even if they are described,
- **methods** which will hide methods, even if they are described,
- **members** which will hide fields and methods, even if they are described,
- **circle** for the circled character in front of class name,
- **stereotype** for the stereotype.

You can also provide, just after the **hide** or **show** keyword:

- **class** for all classes,
- **interface** for all interfaces,
- **enum** for all enums,
- **<>foo1>** for classes which are stereotyped with *foo1*,
- an existing class name.

You can use several **show/hide** commands to define rules and exceptions.

```
@startuml
```

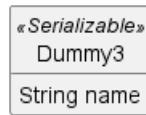
```
class Dummy1 {
    +myMethods()
}

class Dummy2 {
    +hiddenMethod()
}

class Dummy3 <<Serializable>> {
String name
}

hide members
hide <<Serializable>> circle
show Dummy1 methods
show <<Serializable>> fields

@enduml
```



### 3.15 Hide classes

You can also use the **show/hide** commands to hide classes.

This may be useful if you define a large `!included` file, and if you want to hide some classes after file inclusion.



```
@startuml
class Foo1
class Foo2

Foo2 *-- Foo1

hide Foo2

@enduml
```



### 3.16 Remove classes

You can also use the `remove` commands to remove classes.

This may be useful if you define a large !included file, and if you want to remove some classes after file inclusion.

```
@startuml
class Foo1
class Foo2

Foo2 *-- Foo1

remove Foo2

@enduml
```



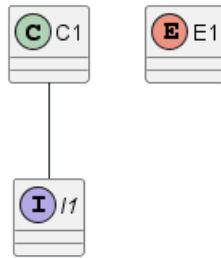
### 3.17 Hide, Remove or Restore tagged element or wildcard

You can put `$tags` (using \$) on elements, then remove, hide or restore components either individually or by tags.

By default, all components are displayed:

```
@startuml
class C1 $tag13
enum E1
interface I1 $tag13
C1 -- I1
@enduml
```





But you can:

- hide \$tag13 components:

```

@startuml
class C1 $tag13
enum E1
interface I1 $tag13
C1 --> I1

hide $tag13
@enduml

```



- or remove \$tag13 components:

```

@startuml
class C1 $tag13
enum E1
interface I1 $tag13
C1 --> I1

remove $tag13
@enduml

```



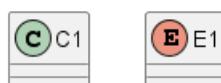
- or remove \$tag13 and restore \$tag1 components:

```

@startuml
class C1 $tag13 $tag1
enum E1
interface I1 $tag13
C1 --> I1

remove $tag13
restore $tag1
@enduml

```



- or remove \* and restore \$tag1 components:

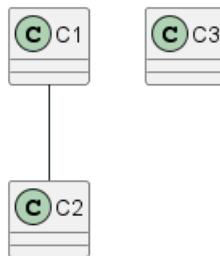
```
@startuml
class C1 $tag13 $tag1
enum E1
interface I1 $tag13
C1 -- I1

remove *
restore $tag1
@enduml
```

### 3.18 Hide or Remove unlinked class

By default, all classes are displayed:

```
@startuml
class C1
class C2
class C3
C1 -- C2
@enduml
```



But you can:

- hide @unlinked classes:

```
@startuml
class C1
class C2
class C3
C1 -- C2

hide @unlinked
@enduml
```



- or remove @unlinked classes:

```
@startuml
class C1
class C2
class C3
```



```
C1 -- C2
```

```
remove @unlinked
@enduml
```



[Adapted from QA-11052]

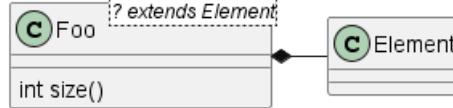
### 3.19 Use generics

You can also use bracket < and > to define generics usage in a class.

```
@startuml
```

```
class Foo<? extends Element> {
    int size()
}
Foo *- Element
```

```
@enduml
```



It is possible to disable this drawing using `skinparam genericDisplay old` command.

### 3.20 Specific Spot

Usually, a spotted character (C, I, E or A) is used for classes, interface, enum and abstract classes.

But you can define your own spot for a class when you define the stereotype, adding a single character and a color, like in this example:

```
@startuml
```

```
class System << (S,#FF7700) Singleton >>
class Date << (D,orchid) >>
@enduml
```



### 3.21 Packages

You can define a package using the `package` keyword, and optionally declare a background color for your package (Using a html color code or name).

Note that package definitions can be nested.

```
@startuml
```



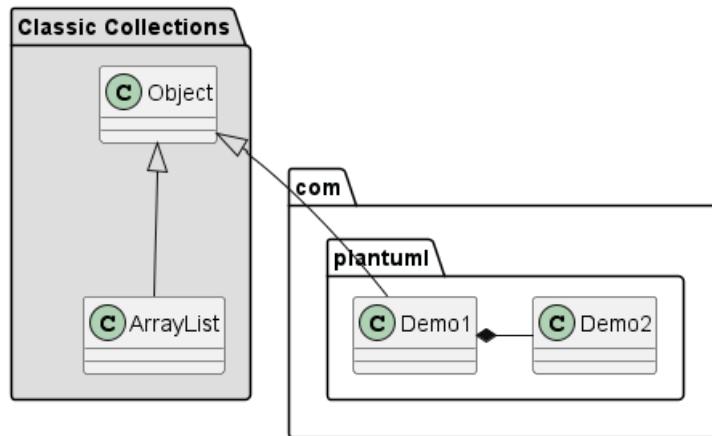
```

package "Classic Collections" #DDDDDD {
    Object <|-- ArrayList
}

package com.plantuml {
    Object <|-- Demo1
    Demo1 *- Demo2
}

@enduml

```



## 3.22 Packages style

There are different styles available for packages.

You can specify them either by setting a default style with the command : `skinparam packageStyle`, or by using a stereotype on the package:

```

@startuml
scale 750 width
package foo1 <<Node>> {
    class Class1
}

package foo2 <<Rectangle>> {
    class Class2
}

package foo3 <<Folder>> {
    class Class3
}

package foo4 <<Frame>> {
    class Class4
}

package foo5 <<Cloud>> {
    class Class5
}

package foo6 <<Database>> {
    class Class6
}

@enduml

```

`@enduml`





You can also define links between packages, like in the following example:

```
@startuml

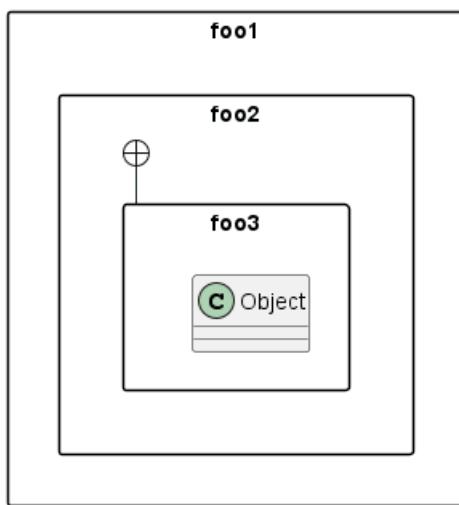
skinparam packageStyle rectangle

package foo1.foo2 {
}

package foo1.foo2.foo3 {
    class Object
}

foo1.foo2 +-- foo1.foo2.foo3

@enduml
```



## 3.23 Namespaces

Starting with version 1.2023.2 (which is online as a beta), PlantUML handles differently namespaces and packages.

There won't be any difference between namespaces and packages anymore: both keywords are now synonymous.

## 3.24 Automatic package creation

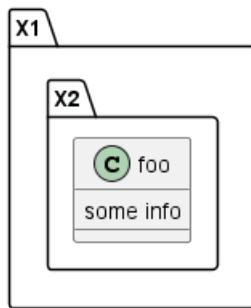
You can define another separator (other than the dot) using the command : `set separator ???`.

```
@startuml
```

```
set separator ::  
class X1::X2::foo {  
    some info  
}
```



```
@enduml
```



You can disable automatic namespace creation using the command `set separator none`.

```
@startuml
```

```

set separator none
class X1.X2.foo {
    some info
}

```

```
@enduml
```



## 3.25 Lollipop interface

You can also define lollipops interface on classes, using the following syntax:

- `bar ()- foo`
- `bar ()-- foo`
- `foo -(() bar`

```
@startuml
```

```

class foo
bar ()- foo
@enduml

```

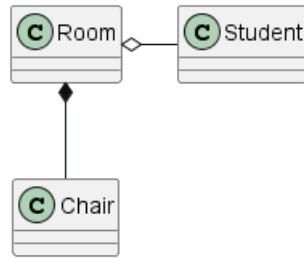


## 3.26 Changing arrows orientation

By default, links between classes have two dashes `--` and are vertically oriented. It is possible to use horizontal link by putting a single dash (or dot) like this:

```
@startuml
Room o- Student
Room *--- Chair
@enduml
```

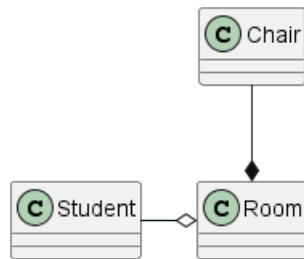




You can also change directions by reversing the link:

```

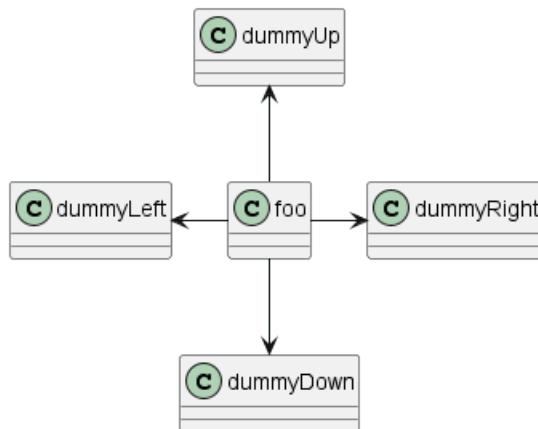
@startuml
Student -o Room
Chair --* Room
@enduml
  
```



It is also possible to change arrow direction by adding `left`, `right`, `up` or `down` keywords inside the arrow:

```

@startuml
foo -left-> dummyLeft
foo -right-> dummyRight
foo -up-> dummyUp
foo -down-> dummyDown
@enduml
  
```



You can shorten the arrow by using only the first character of the direction (for example, `-d-` instead of `-down-`) or the two first characters (`-do-`).

Please note that you should not abuse this functionality : *Graphviz* gives usually good results without tweaking.

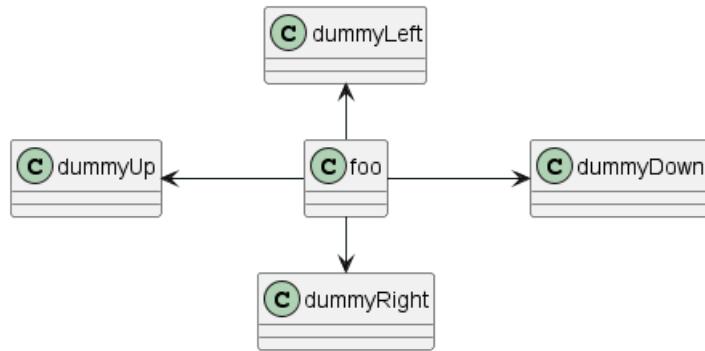
And with the `left to right direction` parameter:

```

@startuml
left to right direction
foo -left-> dummyLeft
foo -right-> dummyRight
foo -up-> dummyUp
  
```



```
foo -down-> dummyDown
@enduml
```

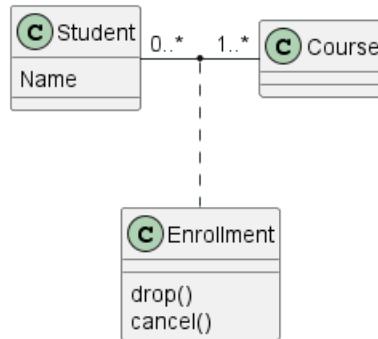


### 3.27 Association classes

You can define *association class* after that a relation has been defined between two classes, like in this example:

```
@startuml
class Student {
    Name
}
Student "0..*" - "1..*" Course
(Student, Course) .. Enrollment

class Enrollment {
    drop()
    cancel()
}
@enduml
```

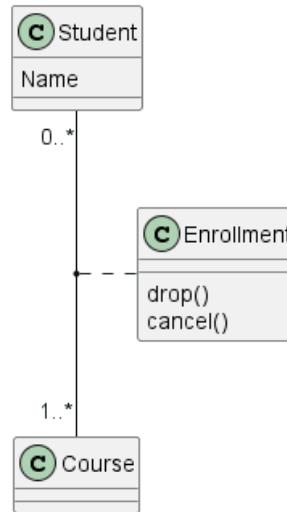


You can define it in another direction:

```
@startuml
class Student {
    Name
}
Student "0..*" -- "1..*" Course
(Student, Course) . Enrollment

class Enrollment {
    drop()
    cancel()
}
@enduml
```





### 3.28 Association on same class

```

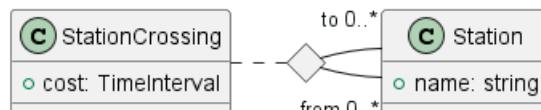
@startuml
class Station {
    +name: string
}

class StationCrossing {
    +cost: TimeInterval
}

<> diamond

StationCrossing . diamond
diamond - "from 0..*" Station
diamond - "to 0..* " Station
@enduml

```



[Ref. Incubation: Associations]

### 3.29 Skinparam

You can use the skinparam command to change colors and fonts for the drawing.

You can use this command :

- In the diagram definition, like any other commands,
- In an included file,
- In a configuration file, provided in the command line or the ANT task.

```
@startuml
```

```

skinparam class {
BackgroundColor PaleGreen
ArrowColor SeaGreen
BorderColor SpringGreen
}

```



```

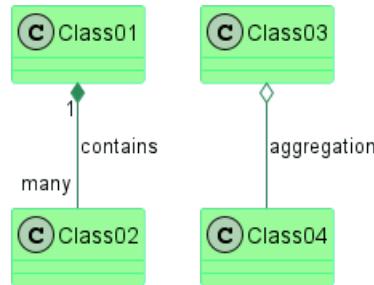
skinparam stereotypeBackgroundColor YellowGreen

Class01 "1" *-- "many" Class02 : contains

Class03 o-- Class04 : aggregation

@enduml

```



### 3.30 Skinned Stereotypes

You can define specific color and fonts for stereotyped classes.

```
@startuml
```

```

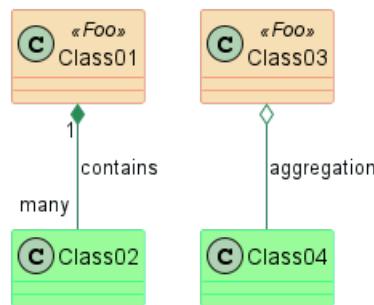
skinparam class {
    backgroundColor PaleGreen
    arrowColor SeaGreen
    borderColor SpringGreen
    backgroundColor<<Foo>> Wheat
    borderColor<<Foo>> Tomato
}
skinparam stereotypeBackgroundColor YellowGreen
skinparam stereotypeBackgroundColor<< Foo >> DimGray

class Class01 <<Foo>>
class Class03 <<Foo>>
Class01 "1" *-- "many" Class02 : contains

```

```
Class03 o-- Class04 : aggregation
```

```
@enduml
```



### 3.31 Color gradient

You can declare individual colors for classes, notes etc using the # notation.

You can use standard color names or RGB codes in various notations, see Colors.

You can also use color gradient for background colors, with the following syntax: two colors names separated either by:



- |,
- /,
- \, or
- -

depending on the direction of the gradient.

For example:

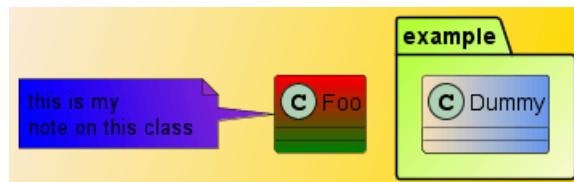
```
@startuml

skinparam backgroundcolor AntiqueWhite/Gold
skinparam classBackgroundColor Wheat|CornflowerBlue

class Foo #red-green
note left of Foo #blue\9932CC
    this is my
    note on this class
end note

package example #GreenYellow/LightGoldenRodYellow {
    class Dummy
}

@enduml
```



### 3.32 Help on layout

Sometimes, the default layout is not perfect...

You can use `together` keyword to group some classes together : the layout engine will try to group them (as if they were in the same package).

You can also use `hidden` links to force the layout.

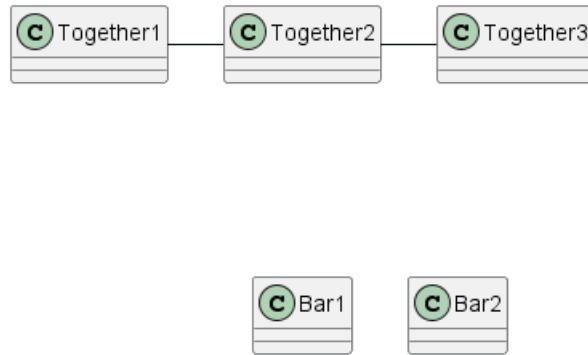
```
@startuml

class Bar1
class Bar2
together {
    class Together1
    class Together2
    class Together3
}
Together1 - Together2
Together2 - Together3
Together2 - [hidden]--> Bar1
Bar1 - [hidden]> Bar2

@enduml
```

`@enduml`





### 3.33 Splitting large files

Sometimes, you will get some very large image files.

You can use the `page (hpages)x(vpags)` command to split the generated image into several files :

`hpags` is a number that indicated the number of horizontal pages, and `vpags` is a number that indicated the number of vertical pages.

You can also use some specific skinparam settings to put borders on splitted pages (see example).

```

@startuml
' Split into 4 pages
page 2x2
skinparam pageMargin 10
skinparam pageExternalColor gray
skinparam pageBorderColor black

class BaseClass

namespace net.dummy #DDDDDD {
    .BaseClass <|-- Person
    Meeting o-- Person

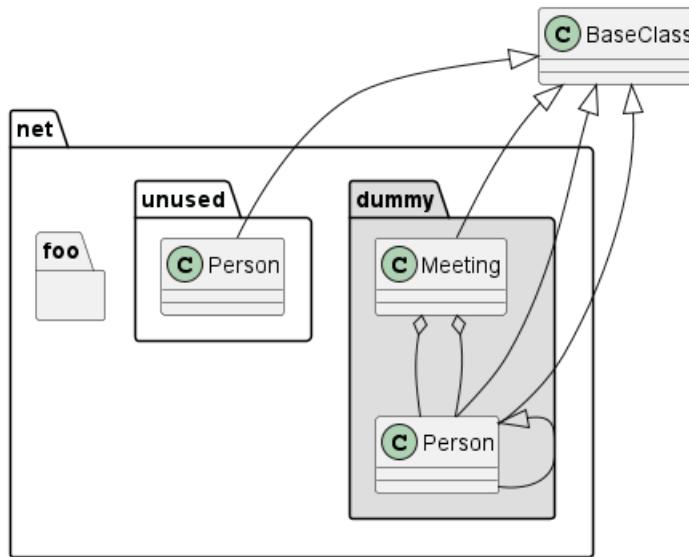
    .BaseClass <|- Meeting
}

namespace net.foo {
    net.dummy.Person <|- Person
    .BaseClass <|-- Person

    net.dummy.Meeting o-- Person
}

BaseClass <|-- net.unused.Person
@enduml
  
```

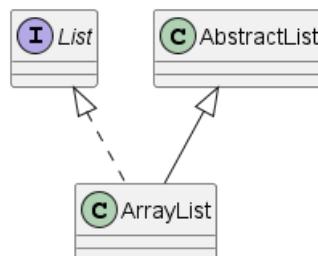




### 3.34 Extends and implements

It is also possible to use `extends` and `implements` keywords.

```
@startuml
class ArrayList implements List
class ArrayList extends AbstractList
@enduml
```



### 3.35 Bracketed relations (linking or arrow) style

#### 3.35.1 Line style

It's also possible to have explicitly bold, dashed, dotted, hidden or plain relation links or arrows:

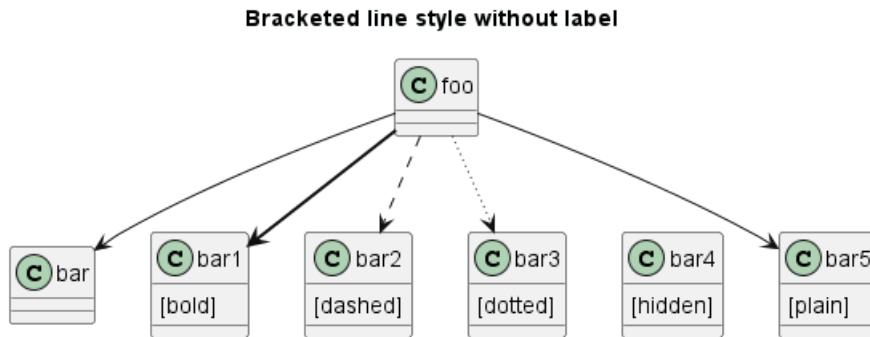
- without label

```
@startuml
title Bracketed line style without label
class foo
class bar
bar1 : [bold]
bar2 : [dashed]
bar3 : [dotted]
bar4 : [hidden]
bar5 : [plain]

foo --> bar
foo -[bold]-> bar1
foo -[dashed]-> bar2
foo -[dotted]-> bar3
```



```
foo -[hidden]-> bar4
foo -[plain]-> bar5
@enduml
```

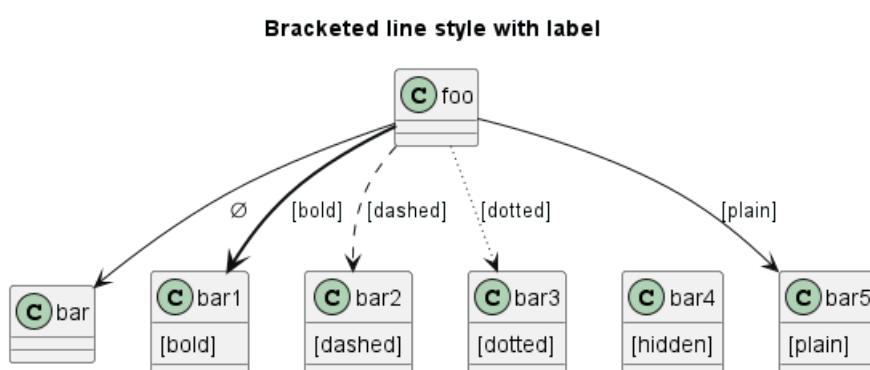


- with label

```
@startuml
title Bracketed line style with label
class foo
class bar
bar1 : [bold]
bar2 : [dashed]
bar3 : [dotted]
bar4 : [hidden]
bar5 : [plain]

foo --> bar      :
foo -[bold]-> bar1 : [bold]
foo -[dashed]-> bar2 : [dashed]
foo -[dotted]-> bar3 : [dotted]
foo -[hidden]-> bar4 : [hidden]
foo -[plain]-> bar5 : [plain]

@enduml
```



[Adapted from QA-4181]

### 3.35.2 Line color

```
@startuml
title Bracketed line color
class foo
class bar
bar1 : [#red]
bar2 : [#green]
```

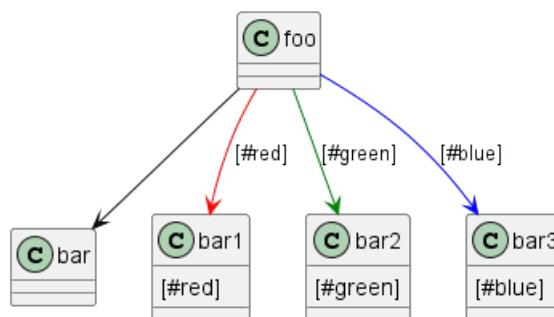


```

bar3 : [#blue]

foo --> bar
foo -[#red]-> bar1      : [#red]
foo -[#green]-> bar2      : [#green]
foo -[#blue]-> bar3      : [#blue]
'foo -[#blue;#yellow;#green]-> bar4
@enduml

```

**Bracketed line color**

### 3.35.3 Line thickness

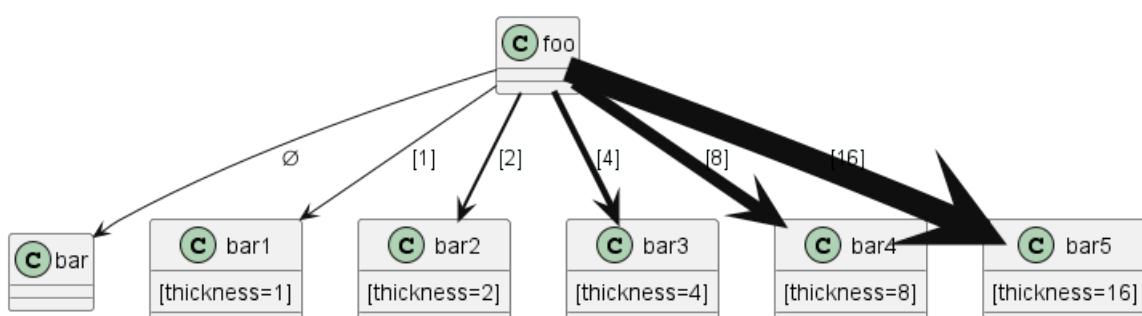
```

@startuml
title Bracketed line thickness
class foo
class bar
bar1 : [thickness=1]
bar2 : [thickness=2]
bar3 : [thickness=4]
bar4 : [thickness=8]
bar5 : [thickness=16]

foo --> bar
foo -[thickness=1]-> bar1      : [1]
foo -[thickness=2]-> bar2      : [2]
foo -[thickness=4]-> bar3      : [4]
foo -[thickness=8]-> bar4      : [8]
foo -[thickness=16]-> bar5      : [16]

@enduml

```

**Bracketed line thickness**

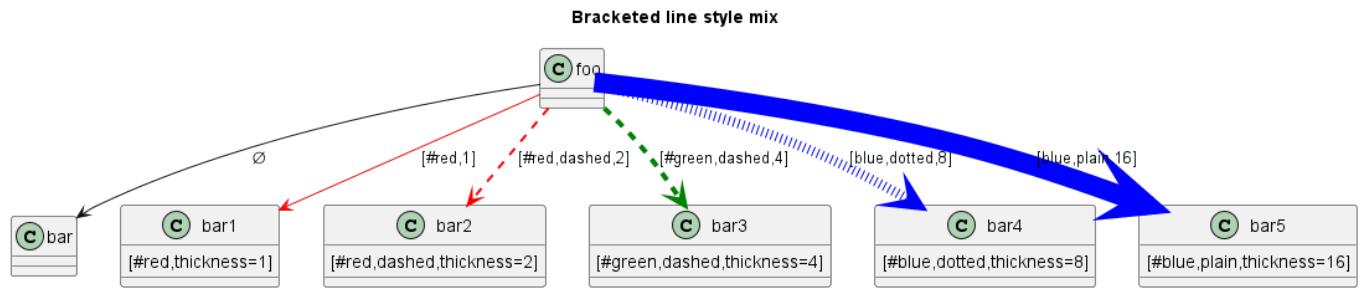
[Ref. QA-4949]



### 3.35.4 Mix

```
@startuml
title Bracketed line style mix
class foo
class bar
bar1 : [#red,thickness=1]
bar2 : [#red,dashed,thickness=2]
bar3 : [#green,dashed,thickness=4]
bar4 : [#blue,dotted,thickness=8]
bar5 : [#blue,plain,thickness=16]

foo --> bar
foo -[#red,thickness=1]-> bar1 : [#red,1]
foo -[#red,dashed,thickness=2]-> bar2 : [#red,dashed,2]
foo -[#green,dashed,thickness=4]-> bar3 : [#green,dashed,4]
foo -[#blue,dotted,thickness=8]-> bar4 : [blue,dotted,8]
foo -[#blue,plain,thickness=16]-> bar5 : [blue,plain,16]
@enduml
```

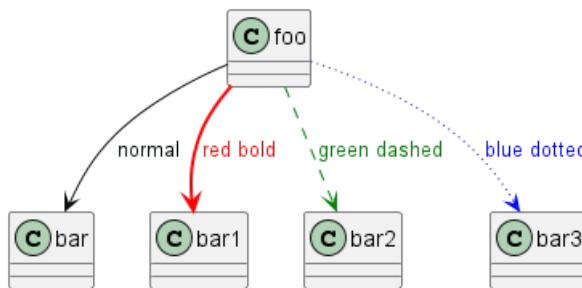


### 3.36 Change relation (linking or arrow) color and style (inline style)

You can change the color or style of individual relation or arrows using the inline following notation:

- #color;line.[bold|dashed|dotted];text:color

```
@startuml
class foo
foo --> bar : normal
foo --> bar1 #line:red;line.bold;text:red : red bold
foo --> bar2 #green;line.dashed;text:green : green dashed
foo --> bar3 #blue;line.dotted;text:blue : blue dotted
@enduml
```



[See similar feature on deployment]

### 3.37 Change class color and style (inline style)

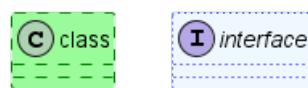
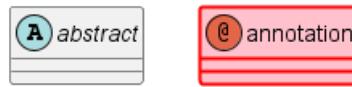
You can change the color or style of individual class using the two following notations:



- `#color ##[style]color`

With background color first (`#color`), then line style and line color (`##[style]color`)

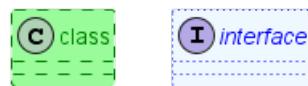
```
@startuml
abstract abstract
annotation annotation #pink ##[bold]red
class class #palegreen ##[dashed]green
interface interface #aliceblue ##[dotted]blue
@enduml
```



[Ref. QA-1487]

- `#[color|back:color];header:color;line:color;line.[bold|dashed|dotted];text:color`

```
@startuml
abstract abstract
annotation annotation #pink;line:red;line.bold;text:red
class class #palegreen;line:green;line.dashed;text:green
interface interface #aliceblue;line:blue;line.dotted;text:blue
@enduml
```

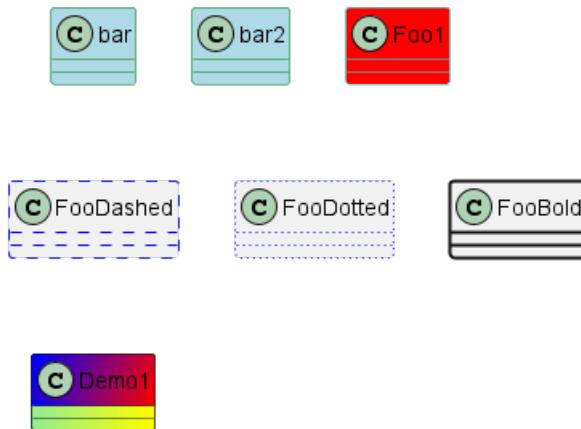


First original example:

```
@startuml
class bar #line:green;back:lightblue
class bar2 #lightblue;line:green

class Foo1 #back:red;line:00FFFF
class FooDashed #line.dashed:blue
class FooDotted #line.dotted:blue
class FooBold #line.bold
class Demo1 #back:lightgreen|yellow;header:blue/red
@enduml
```





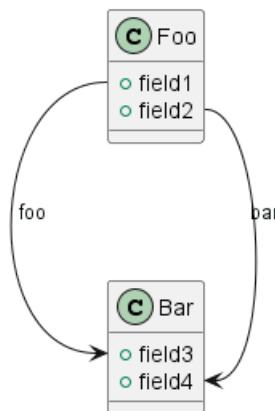
[Ref. QA-3770]

### 3.38 Arrows from/to class members

```
@startuml
class Foo {
+ field1
+ field2
}

class Bar {
+ field3
+ field4
}

Foo::field1 --> Bar::field3 : foo
Foo::field2 --> Bar::field4 : bar
@enduml
```



[Ref. QA-3636]

```
@startuml
left to right direction

class User {
    id : INTEGER
    ..
    other_id : INTEGER
}

class Email {
```

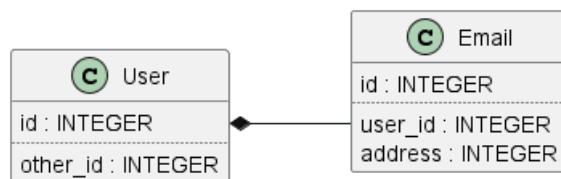


```

id : INTEGER
..
user_id : INTEGER
address : INTEGER
}

User::id *-- Email::user_id
@enduml

```



[Ref. QA-5261]

### 3.39 Grouping inheritance arrow heads

You can merge all arrow heads using the `skinparam groupInheritance 1`, with a threshold as parameter.

#### 3.39.1 GroupInheritance 1 (no grouping)

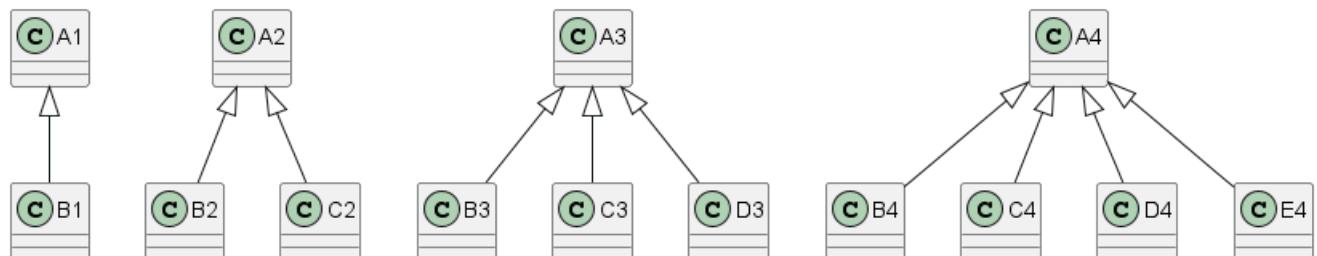
```
@startuml
skinparam groupInheritance 1
```

```
A1 <|-- B1
```

```
A2 <|-- B2
A2 <|-- C2
```

```
A3 <|-- B3
A3 <|-- C3
A3 <|-- D3
```

```
A4 <|-- B4
A4 <|-- C4
A4 <|-- D4
A4 <|-- E4
@enduml
```



#### 3.39.2 GroupInheritance 2 (grouping from 2)

```
@startuml
skinparam groupInheritance 2
```

```
A1 <|-- B1
```

```
A2 <|-- B2
```

```
A2 <|-- C2
```

```
A3 <|-- B3
```

```
A3 <|-- C3
```

```
A3 <|-- D3
```

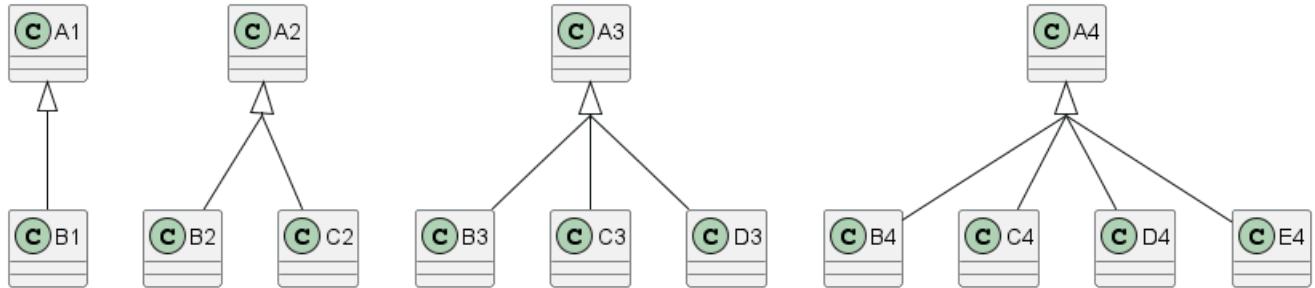
```
A4 <|-- B4
```

```
A4 <|-- C4
```

```
A4 <|-- D4
```

```
A4 <|-- E4
```

```
@enduml
```



### 3.39.3 GroupInheritance 3 (grouping only from 3)

```
@startuml
```

```
skinparam groupInheritance 3
```

```
A1 <|-- B1
```

```
A2 <|-- B2
```

```
A2 <|-- C2
```

```
A3 <|-- B3
```

```
A3 <|-- C3
```

```
A3 <|-- D3
```

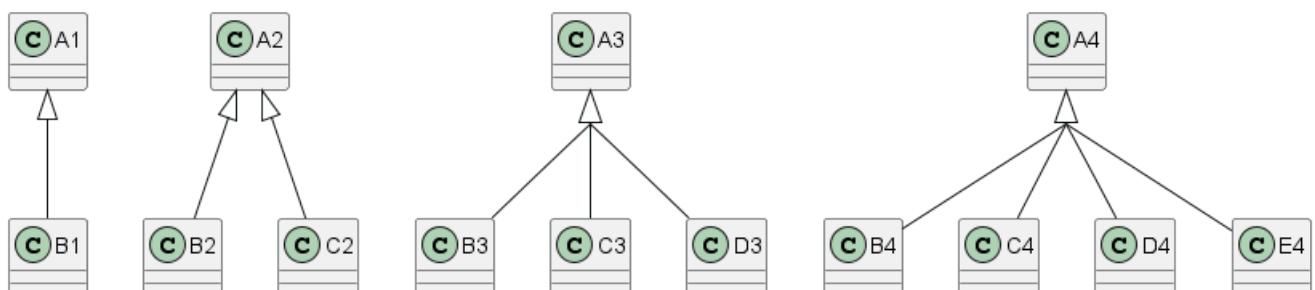
```
A4 <|-- B4
```

```
A4 <|-- C4
```

```
A4 <|-- D4
```

```
A4 <|-- E4
```

```
@enduml
```



### 3.39.4 GroupInheritance 4 (grouping only from 4)

```
@startuml
```

```
skinparam groupInheritance 4
```

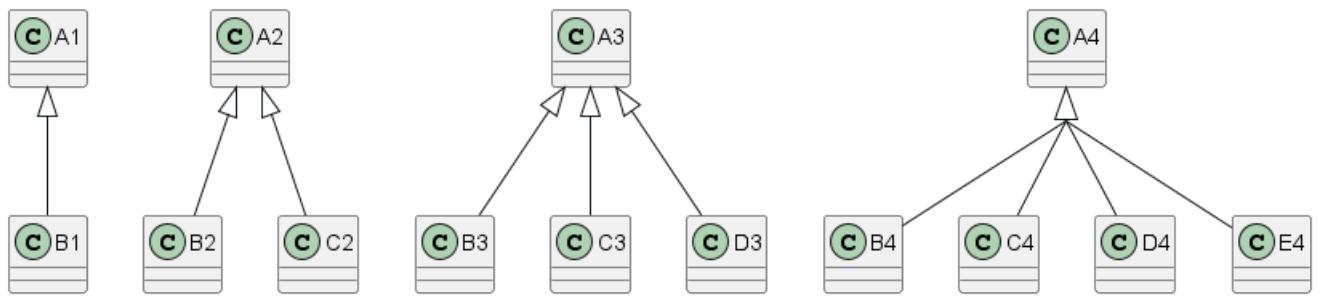


```
A1 <|-- B1
```

```
A2 <|-- B2
A2 <|-- C2
```

```
A3 <|-- B3
A3 <|-- C3
A3 <|-- D3
```

```
A4 <|-- B4
A4 <|-- C4
A4 <|-- D4
A4 <|-- E4
@enduml
```



[Ref. QA-3193, and Defect QA-13532]

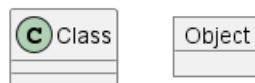
## 3.40 Display JSON Data on Class or Object diagram

### 3.40.1 Simple example

```

@startuml
class Class
object Object
json JSON {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml

```



JSON	
fruit	Apple
size	Large
color	Red
	Green

[Ref. QA-15481]

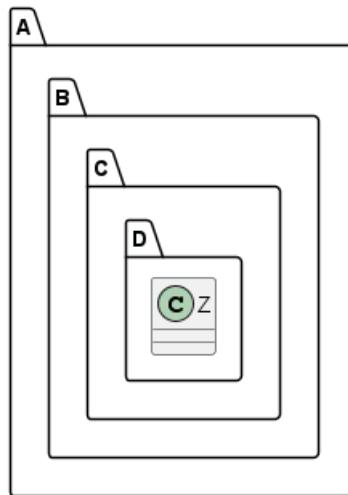
For another example, see on JSON page.



### 3.41 Packages and Namespaces Enhancement

[From V1.2023.2+, and V1.2023.5]

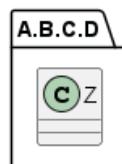
```
@startuml
class A.B.C.D.Z {
}
@enduml
```



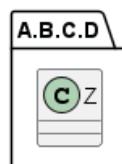
```
@startuml
set separator none
class A.B.C.D.Z {
}
@enduml
```



```
@startuml
!pragma useIntermediatePackages false
class A.B.C.D.Z {
}
@enduml
```



```
@startuml
set separator none
package A.B.C.D {
    class Z {
    }
}
@enduml
```



[Ref. GH-1352]



## 4 Object Diagram

An **object diagram** is a graphical representation that showcases objects and their relationships at a specific moment in time. It provides a snapshot of the system's structure, capturing the static view of the instances present and their associations.

**PlantUML** offers a simple and intuitive way to create object diagrams using plain text. Its user-friendly syntax allows for quick diagram creation without the need for complex GUI tools. Moreover, the PlantUML forum provides a platform for users to discuss, share, and seek assistance, fostering a collaborative community. By choosing PlantUML, users benefit from both the efficiency of markdown-based diagramming and the support of an active community.

### 4.1 Definition of objects

You define instances of objects using the `object` keyword.

```
@startuml
object firstObject
object "My Second Object" as o2
@enduml
```



### 4.2 Relations between objects

Relations between objects are defined using the following symbols :

Type	Symbol	Image
Extension	< --	
Composition	*---	
Aggregation	o--	

It is possible to replace -- by .. to have a dotted line.

Knowing those rules, it is possible to draw the following drawings.

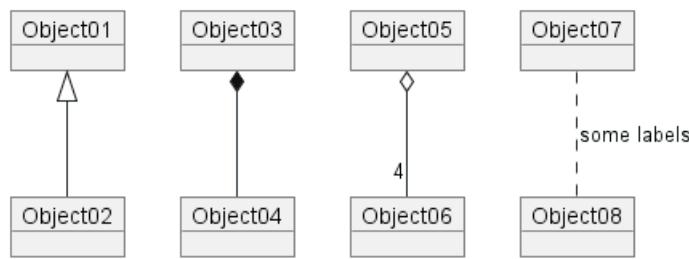
It is possible to add a label on the relation, using : followed by the text of the label.

For cardinality, you can use double-quotes "" on each side of the relation.

```
@startuml
object Object01
object Object02
object Object03
object Object04
object Object05
object Object06
object Object07
object Object08

Object01 <|-- Object02
Object03 *--- Object04
Object05 o-- "4" Object06
Object07 .. Object08 : some labels
@enduml
```





### 4.3 Associations objects

```
@startuml
object o1
object o2
diamond dia
object o3
```

```
o1 --> dia
o2 --> dia
dia --> o3
@enduml
```



### 4.4 Adding fields

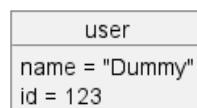
To declare fields, you can use the symbol : followed by the field's name.

```
@startuml
```

```
object user
```

```
user : name = "Dummy"
user : id = 123
```

```
@enduml
```



It is also possible to group all fields between brackets {}.

```
@startuml
```

```
object user {
    name = "Dummy"
    id = 123
}
```



```
@enduml
```

user
name = "Dummy"
id = 123

## 4.5 Common features with class diagrams

- Hide attributes, methods...
- Defines notes
- Use packages
- Skin the output

## 4.6 Map table or associative array

You can define a map table or associative array, with `map` keyword and `=>` separator.

```
@startuml
map CapitalCity {
    UK => London
    USA => Washington
    Germany => Berlin
}
@enduml
```

CapitalCity	
UK	London
USA	Washington
Germany	Berlin

```
@startuml
map "Map **Contry => CapitalCity**" as CC {
    UK => London
    USA => Washington
    Germany => Berlin
}
@enduml
```

Map Contry => CapitalCity	
UK	London
USA	Washington
Germany	Berlin

```
@startuml
map "map: Map<Integer, String>" as users {
    1 => Alice
    2 => Bob
    3 => Charlie
}
@enduml
```

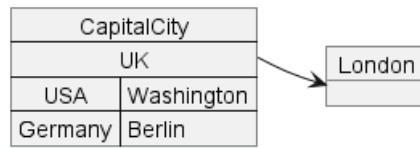


map: Map<Integer, String>	
1	Alice
2	Bob
3	Charlie

And add link with object.

```
@startuml
object London

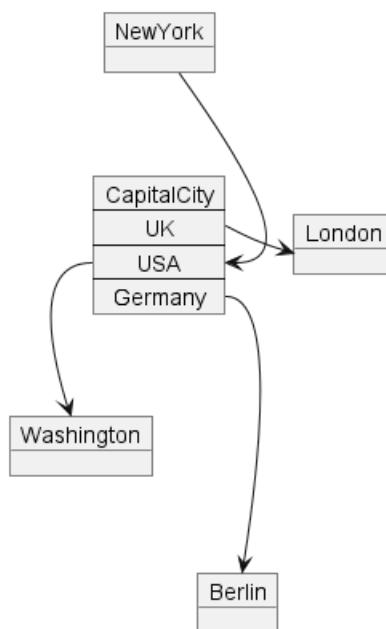
map CapitalCity {
    UK *-> London
    USA => Washington
    Germany => Berlin
}
@enduml
```



```
@startuml
object London
object Washington
object Berlin
object NewYork

map CapitalCity {
    UK *-> London
    USA *--> Washington
    Germany *---> Berlin
}
```

```
NewYork --> CapitalCity::USA
@enduml
```



[Ref. #307]

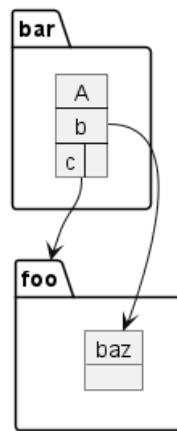


```

@startuml
package foo {
    object baz
}

package bar {
    map A {
        b *-> foo.baz
        c =>
    }
}
A::c --> foo
@enduml

```



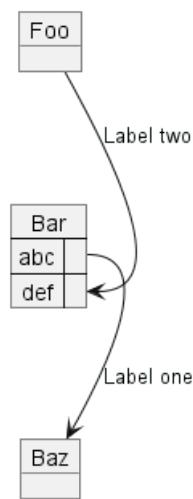
[Ref. QA-12934]

```

@startuml
object Foo
map Bar {
    abc=>
    def=>
}
object Baz

Bar::abc --> Baz : Label one
Foo --> Bar::def : Label two
@enduml

```



[Ref. #307]

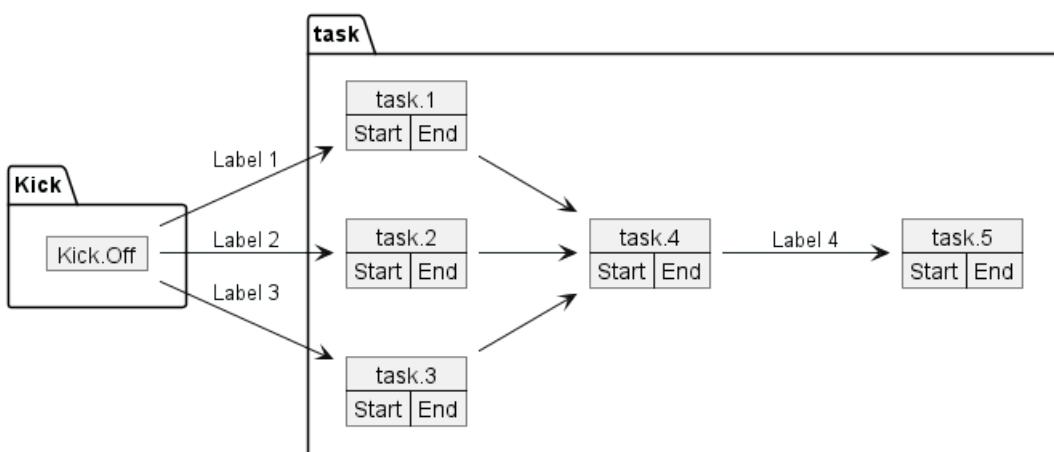
## 4.7 Program (or project) evaluation and review technique (PERT) with map

You can use map table in order to make Program (or project) evaluation and review technique (PERT) diagram.

```
@startuml PERT
left to right direction
' Horizontal lines: -->, <--, <-->
' Vertical lines: ->, <-, <->
title PERT: Project Name

map Kick.Off {
}
map task.1 {
    Start => End
}
map task.2 {
    Start => End
}
map task.3 {
    Start => End
}
map task.4 {
    Start => End
}
map task.5 {
    Start => End
}
Kick.Off --> task.1 : Label 1
Kick.Off --> task.2 : Label 2
Kick.Off --> task.3 : Label 3
task.1 --> task.4
task.2 --> task.4
task.3 --> task.4
task.4 --> task.5 : Label 4
@enduml
```

**PERT: Project Name**



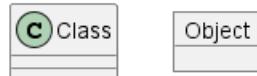
[Ref. QA-12337]



## 4.8 Display JSON Data on Class or Object diagram

### 4.8.1 Simple example

```
@startuml
class Class
object Object
json JSON {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml
```



JSON	
fruit	Apple
size	Large
color	Red
	Green

[Ref. QA-15481]

For another example, see on JSON page.



## 5 Activity Diagram (legacy)

This is the old **Activity Diagram (legacy)** syntax, to see the new current version see: [Activity Diagram \(new\)](#).

### 5.1 Simple Action

You can use (\*) for the starting point and ending point of the activity diagram.

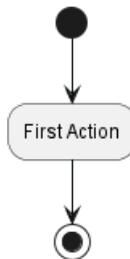
In some occasion, you may want to use (\*top) to force the starting point to be at the top of the diagram.

Use --> for arrows.

```
@startuml
```

```
(*) --> "First Action"
"First Action" --> (*)
```

```
@enduml
```



### 5.2 Label on arrows

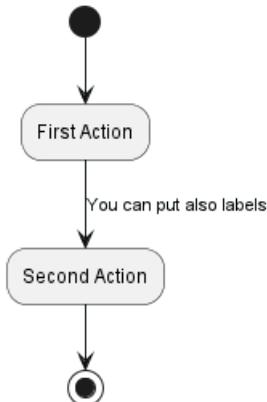
By default, an arrow starts at the last used activity.

You can put a label on an arrow using brackets [ and ] just after the arrow definition.

```
@startuml
```

```
(*) --> "First Action"
-->[You can put also labels] "Second Action"
--> (*)
```

```
@enduml
```



### 5.3 Changing arrow direction

You can use -> for horizontal arrows. It is possible to force arrow's direction using the following syntax:

- -down-> (default arrow)

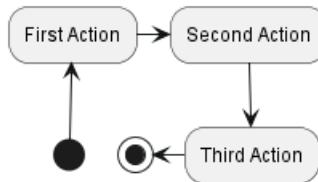


- -right-> or ->
- -left->
- -up->

@startuml

```
(*) -up-> "First Action"
-right-> "Second Action"
--> "Third Action"
-left-> (*)
```

@enduml



## 5.4 Branches

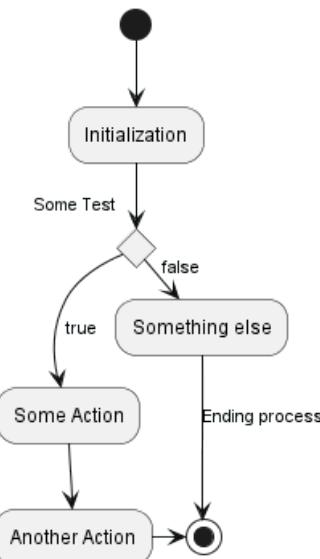
You can use `if/then/else` keywords to define branches.

@startuml

```
(*) --> "Initialization"

if "Some Test" then
    -->[true] "Some Action"
    --> "Another Action"
    -right-> (*)
else
    ->[false] "Something else"
    -->[Ending process] (*)
endif
```

@enduml



Unfortunately, you will have to sometimes repeat the same activity in the diagram text:

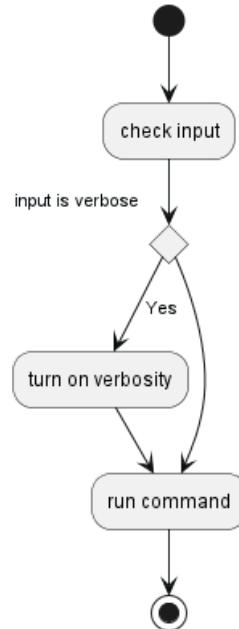
@startuml



```

(*) --> "check input"
If "input is verbose" then
--> [Yes] "turn on verbosity"
--> "run command"
else
--> "run command"
Endif
-->(*)
@enduml

```



## 5.5 More on Branches

By default, a branch is connected to the last defined activity, but it is possible to override this and to define a link with the `if` keywords.

It is also possible to nest branches.

```

@startuml

(*) --> if "Some Test" then

    -->[true] "action 1"

    if "" then
        -> "action 3" as a3
    else
        if "Other test" then
            -left-> "action 5"
        else
            --> "action 6"
        endif
    endif

else

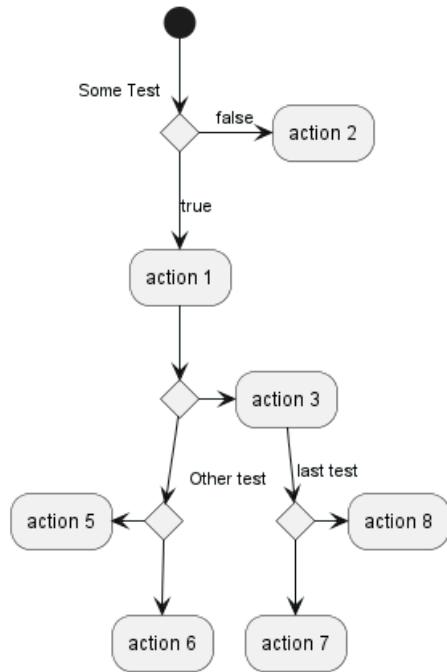
    ->[false] "action 2"

endif

```

```
a3 --> if "last test" then
    --> "action 7"
else
    -> "action 8"
endif

@enduml
```



## 5.6 Synchronization

You can use === code === to display synchronization bars.

```
@startuml
```

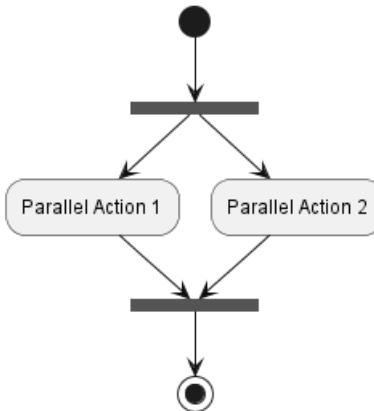
```
(*) --> ===B1===
--> "Parallel Action 1"
--> ===B2===

==B1==> "Parallel Action 2"
--> ==B2==

--> (*)
```

```
@enduml
```





## 5.7 Long action description

When you declare activities, you can span on several lines the description text. You can also add `as` in the description.

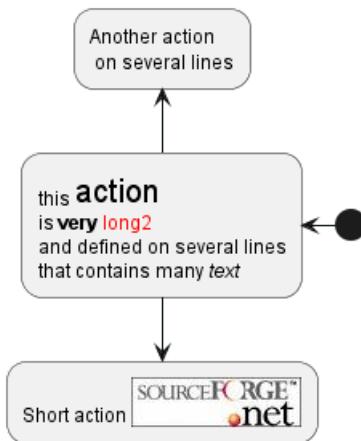
You can also give a short code to the activity with the `as` keyword. This code can be used latter in the diagram description.

```

@startuml
(*) -left-> "this <size:20>action</size>
is <b>very</b> <color:red>long2</color>
and defined on several lines
that contains many <i>text</i>" as A1

-up-> "Another action\n on several lines"

A1 --> "Short action <img:sourceforge.jpg>"
@enduml
  
```



## 5.8 Notes

You can add notes on a activity using the commands `note left`, `note right`, `note top` or `note bottom`, just after the description of the activity you want to note.

If you want to put a note on the starting point, define the note at the very beginning of the diagram description.

You can also have a note on several lines, using the `endnote` keywords.

```
@startuml
```

```
(*) --> "Some action"
```

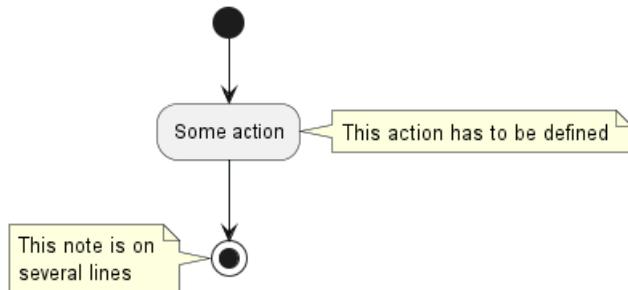


```

note right: This action has to be defined
"Some action" --> (*)
note left
  This note is on
  several lines
end note

@enduml

```



## 5.9 Partition

You can define a partition using the `partition` keyword, and optionally declare a background color for your partition (Using a html color code or name)

When you declare activities, they are automatically put in the last used partition.

You can close the partition definition using a closing bracket `}`.

```
@startuml
```

```

partition Conductor {
    (*) --> "Climbs on Platform"
    --> === S1 ===
    --> Bows
}

partition Audience #LightSkyBlue {
    === S1 === --> Applauds
}

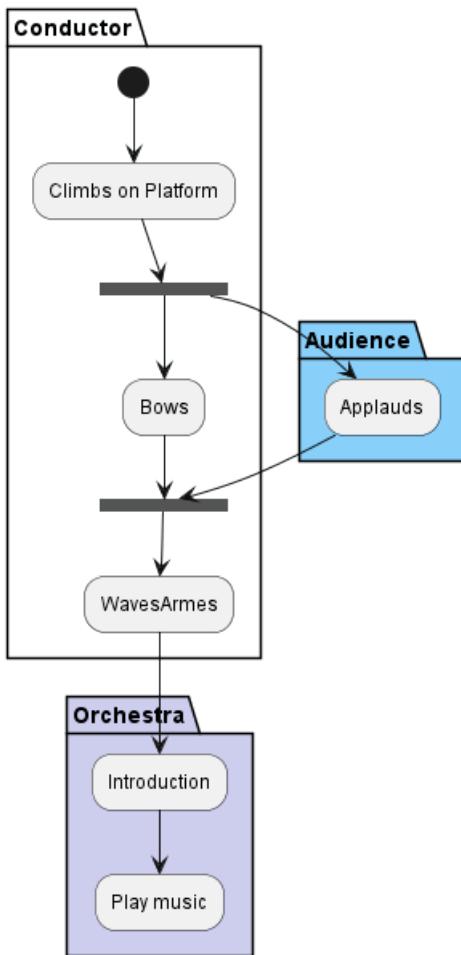
partition Conductor {
    Bows --> === S2 ===
    --> WavesArmes
    Applauds --> === S2 ===
}

partition Orchestra #CCCCEE {
    WavesArmes --> Introduction
    --> "Play music"
}

```

```
@enduml
```





## 5.10 Skinparam

You can use the skinparam command to change colors and fonts for the drawing.

You can use this command :

- In the diagram definition, like any other commands,
- In an included file,
- In a configuration file, provided in the command line or the ANT task.

You can define specific color and fonts for stereotyped activities.

@startuml

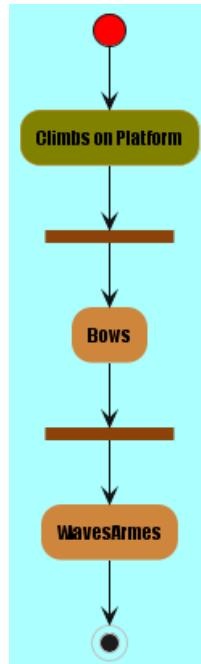
```

skinparam backgroundColor #AFFFFF
skinparam activity {
  StartColor red
  BarColor SaddleBrown
  EndColor Silver
  BackgroundColor Peru
  BackgroundColor<< Begin >> Olive
  BorderColor Peru
  FontName Impact
}
(*)
--> "Climbs on Platform" << Begin >>
--> === S1 ===
--> Bows
  
```



```
--> === S2 ===
--> WavesArmes
--> (*)
```

@enduml



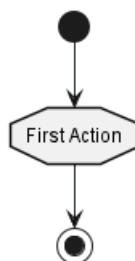
## 5.11 Octagon

You can change the shape of activities to octagon using the `skinparam activityShape octagon` command.

```
@startuml
'Default is skinparam activityShape roundBox
skinparam activityShape octagon

(*) --> "First Action"
"First Action" --> (*)
```

@enduml



## 5.12 Complete example

```
@startuml
title Servlet Container

(*) --> "ClickServlet.handleRequest()"
--> "new Page"

if "Page.onSecurityCheck" then
```



```
->[true] "Page.onInit()"

if "isForward?" then
->[no] "Process controls"

if "continue processing?" then
-->[yes] ===RENDERING===
else
-->[no] ===REDIRECT_CHECK===
endif

else
-->[yes] ===RENDERING===
endif

if "is Post?" then
-->[yes] "Page.onPost()"
--> "Page.onRender()" as render
--> ===REDIRECT_CHECK===
else
-->[no] "Page.onGet()"
--> render
endif

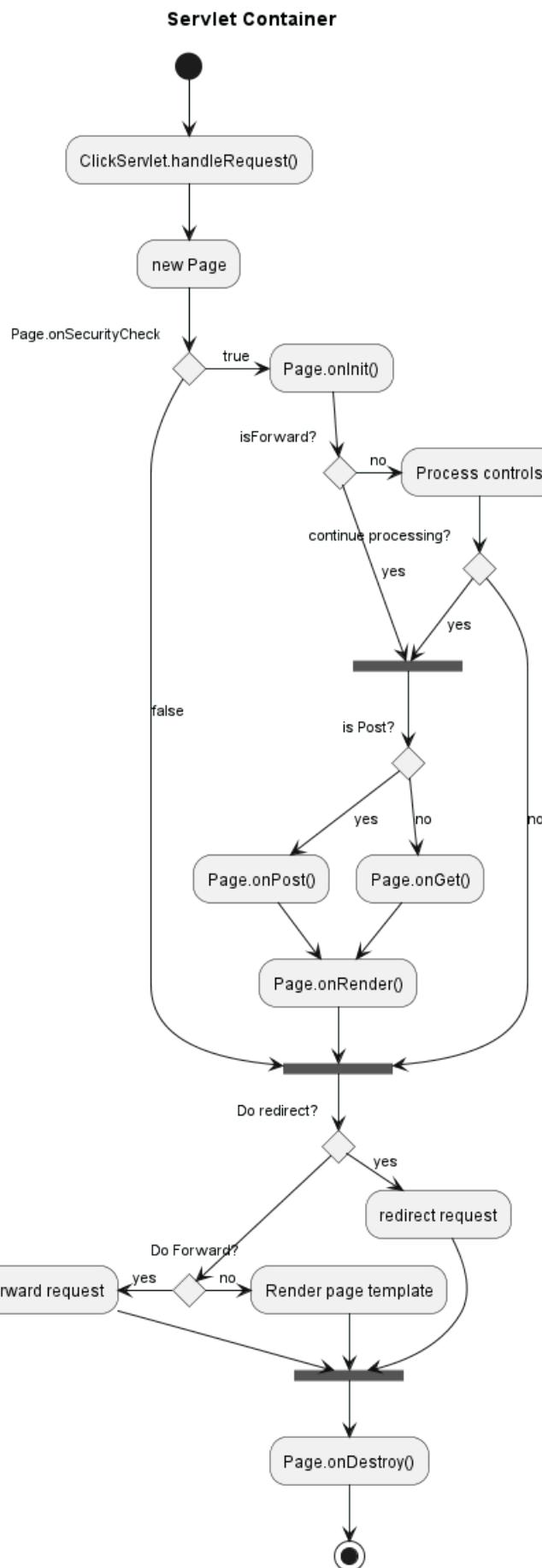
else
-->[false] ===REDIRECT_CHECK===
endif

if "Do redirect?" then
->[yes] "redirect request"
--> ==BEFORE_DESTROY===
else
if "Do Forward?" then
-left->[yes] "Forward request"
--> ==BEFORE_DESTROY===
else
-right->[no] "Render page template"
--> ==BEFORE_DESTROY===
endif
endif

--> "Page.onDestroy()"
-->(*)
```

@enduml





## 6 Activity Diagram (New Syntax)

The previous syntax used for activity diagrams encountered several limitations and maintainability issues. Recognizing these drawbacks, we have introduced a wholly revamped syntax and implementation that is not only user-friendly but also more stable.

### 6.0.1 Benefits of the New Syntax

- No Dependency on Graphviz: Just like with sequence diagrams, the new syntax eliminates the necessity for Graphviz installation, thereby simplifying the setup process.
- Ease of Maintenance: The intuitive nature of the new syntax means it is easier to manage and maintain your diagrams.

### 6.0.2 Transition to the New Syntax

While we will continue to support the old syntax to maintain compatibility, we highly encourage users to migrate to the new syntax to leverage the enhanced features and benefits it offers.

Make the shift today and experience a more streamlined and efficient diagramming process with the new activity diagram syntax.

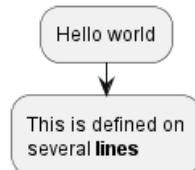
### 6.1 Simple action

Activities label starts with : and ends with ;.

Text formatting can be done using creole wiki syntax.

They are implicitly linked in their definition order.

```
@startuml
:Hello world;
:This is defined on
several **lines**;
@enduml
```

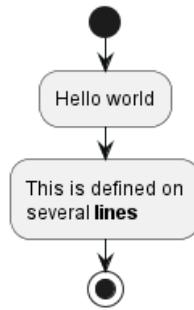


### 6.2 Start/Stop/End

You can use `start` and `stop` keywords to denote the beginning and the end of a diagram.

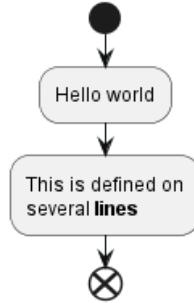
```
@startuml
start
:Hello world;
:This is defined on
several **lines**;
stop
@enduml
```





You can also use the `end` keyword.

```
@startuml
start
:Hello world;
:This is defined on
several **lines**;
end
@enduml
```



### 6.3 Conditional

You can use `if`, `then` and `else` keywords to put tests in your diagram. Labels can be provided using parentheses.

The 3 syntaxes are possible:

- `if (...) then (...)`

```
@startuml

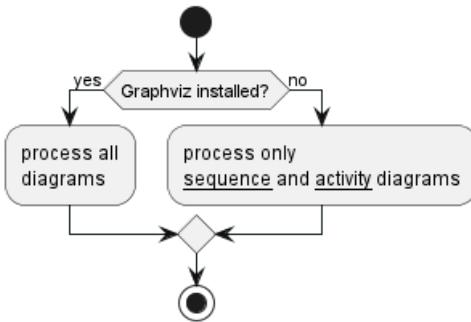
start

if (Graphviz installed?) then (yes)
  :process all\ndiagrams;
else (no)
  :process only
  __sequence__ and __activity__ diagrams;
endif

stop

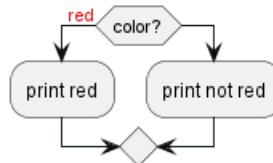
@enduml
```





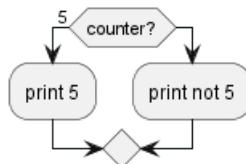
- if (...) is (...) then

```
@startuml
if (color?) is (<color:red>red) then
:print red;
else
:print not red;
@enduml
```



- if (...) equals (...) then

```
@startuml
if (counter?) equals (5) then
:print 5;
else
:print not 5;
@enduml
```



[Ref. QA-301]

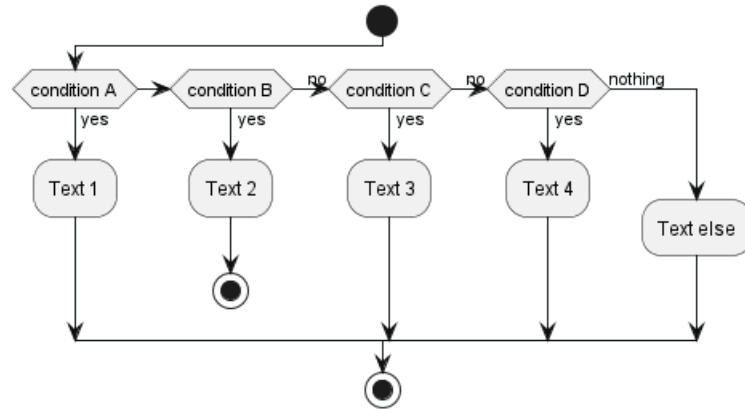
### 6.3.1 Several tests (horizontal mode)

You can use the `elseif` keyword to have several tests (*by default, it is the horizontal mode*):

```
@startuml
start
if (condition A) then (yes)
:Text 1;
elseif (condition B) then (yes)
:Text 2;
stop
(no) elseif (condition C) then (yes)
:Text 3;
(no) elseif (condition D) then (yes)
:Text 4;
else (nothing)
```



```
:Text else;
endif
stop
@enduml
```

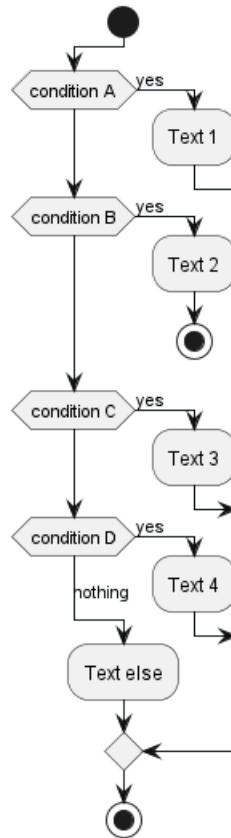


### 6.3.2 Several tests (vertical mode)

You can use the command `!pragma useVerticalIf on` to have the tests in vertical mode:

```
@startuml
!pragma useVerticalIf on
start
if (condition A) then (yes)
  :Text 1;
elseif (condition B) then (yes)
  :Text 2;
  stop
elseif (condition C) then (yes)
  :Text 3;
elseif (condition D) then (yes)
  :Text 4;
else (nothing)
  :Text else;
endif
stop
@enduml
```





You can use the `-P` command-line option to specify the pragma:

```
java -jar plantuml.jar -PuseVerticalIf=on
```

[Refs. QA-3931, issue-582]

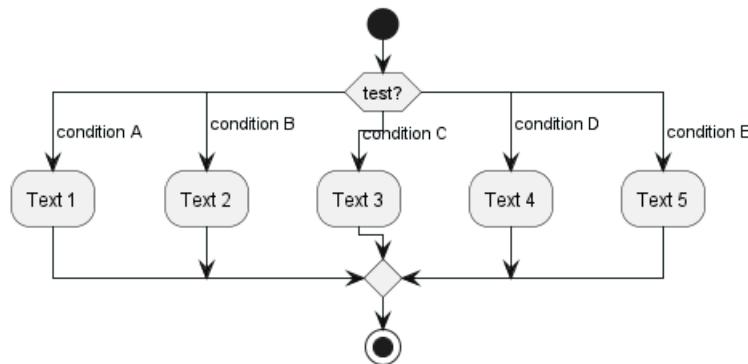
## 6.4 Switch and case [switch, case, endswitch]

You can use `switch`, `case` and `endswitch` keywords to put switch in your diagram.

Labels can be provided using parentheses.

```
@startuml
start
switch (test?)
case ( condition A )
    :Text 1;
case ( condition B )
    :Text 2;
case ( condition C )
    :Text 3;
case ( condition D )
    :Text 4;
case ( condition E )
    :Text 5;
endswitch
stop
@enduml
```

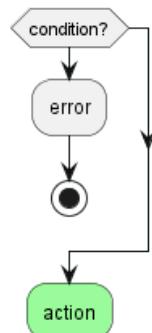




## 6.5 Conditional with stop on an action [kill, detach]

You can stop action on a if loop.

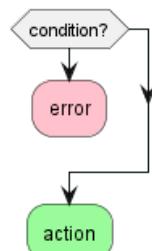
```
@startuml
if (condition?) then
    :error;
    stop
endif
#palegreen:action;
@enduml
```



But if you want to stop at the precise action, you can use the `kill` or `detach` keyword:

- kill

```
@startuml
if (condition?) then
    #pink:error;
    kill
endif
#palegreen:action;
@enduml
```

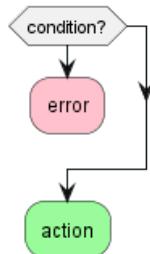


[Ref. QA-265]

- detach



```
@startuml
if (condition?) then
  #pink:error;
  detach
endif
#palegreen:action;
@enduml
```



## 6.6 Repeat loop

### 6.6.1 Simple repeat loop

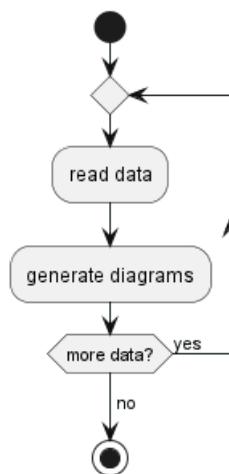
You can use `repeat` and `repeat while` keywords to have repeat loops.

```
@startuml

start

repeat
  :read data;
  :generate diagrams;
repeat while (more data?) is (yes)
->no;
stop

@enduml
```



### 6.6.2 Repeat loop with repeat action and backward action

It is also possible to use a full action as `repeat` target and insert an action in the return path using the `backward` keyword.

```
@startuml

start
```

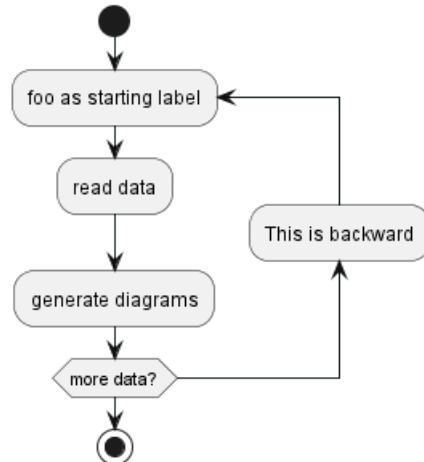
```

repeat :foo as starting label;
  :read data;
  :generate diagrams;
backward:This is backward;
repeat while (more data?)

stop

@enduml

```



[Ref. QA-5826]

## 6.7 Break on a repeat loop [break]

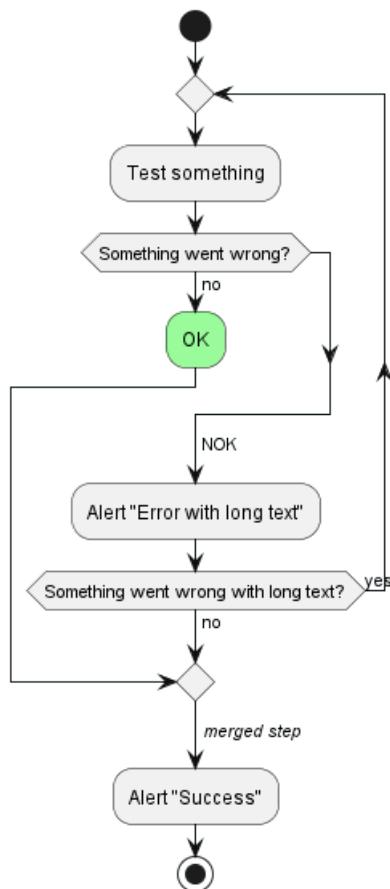
You can use the `break` keyword after an action on a loop.

```

@startuml
start
repeat
  :Test something;
  if (Something went wrong?) then (no)
    #palegreen:OK;
    break
  endif
  ->NOK;
  :Alert "Error with long text";
repeat while (Something went wrong with long text?) is (yes) not (no)
->//merged step//;
:Alert "Success";
stop
@enduml

```





[Ref. QA-6105]

## 6.8 Goto and Label Processing [label, goto]

It is currently only experimental

You can use `label` and `goto` keywords to denote goto processing, with:

- `label <label_name>`
- `goto <label_name>`

```

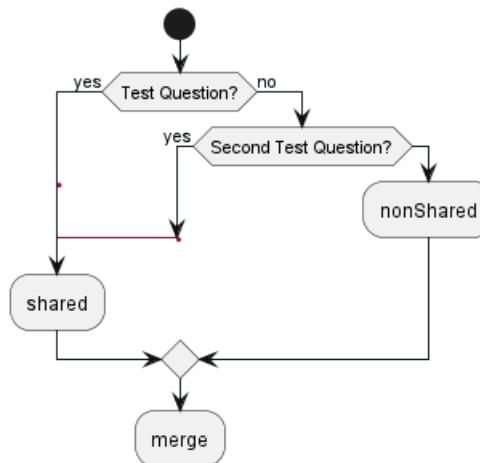
@startuml
title Point two queries to same activity\nwith `goto`
start
if (Test Question?) then (yes)
'space label only for alignment
label sp_lab0
label sp_lab1
'real label
label lab
:shared;
else (no)
if (Second Test Question?) then (yes)
label sp_lab2
goto sp_lab1
else
:nonShared;
endif
endif
:merge;

```



```
@enduml
```

**Point two queries to same activity with `goto`**



[Ref. QA-15026, QA-12526 and initially QA-1626]

## 6.9 While loop

### 6.9.1 Simple while loop

You can use `while` and `endwhile` keywords to have while loop.

```
@startuml
```

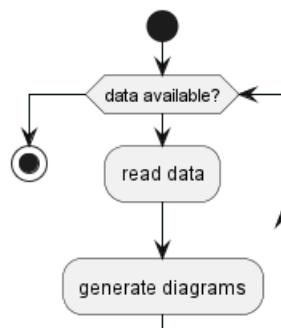
```

start

while (data available?)
  :read data;
  :generate diagrams;
endwhile
  
```

```
stop
```

```
@enduml
```



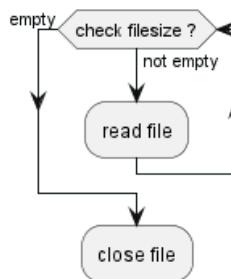
It is possible to provide a label after the `endwhile` keyword, or using the `is` keyword.

```

@startuml
while (check filesize ?) is (not empty)
  :read file;
endwhile (empty)
:close file;
  
```



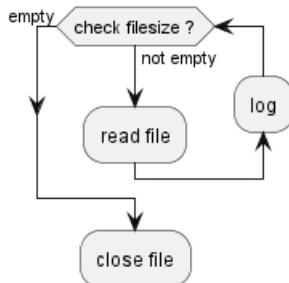
```
@enduml
```



### 6.9.2 While loop with backward action

It is also possible to insert an action in the return path using the `backward` keyword.

```
@startuml
while (check filesize ?) is (not empty)
  :read file;
  backward:log;
endwhile (empty)
:close file;
@enduml
```



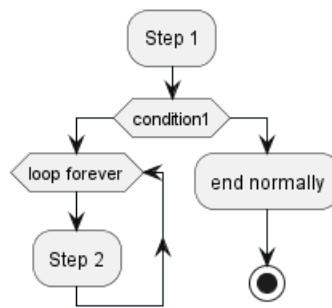
[Ref. QA-11144]

### 6.9.3 Infinite while loop

If you are using `detach` to form an infinite while loop, then you will want to also hide the partial arrow that results using `-[hidden]->`

```
@startuml
:Step 1;
if (condition1) then
  while (loop forever)
    :Step 2;
    endwhile
    -[hidden]->
    detach
else
  :end normally;
  stop
endif
@enduml
```



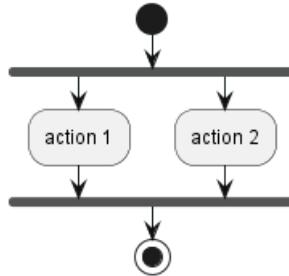


## 6.10 Parallel processing [fork, fork again, end fork, end merge]

You can use `fork`, `fork again` and `end fork` or `end merge` keywords to denote parallel processing.

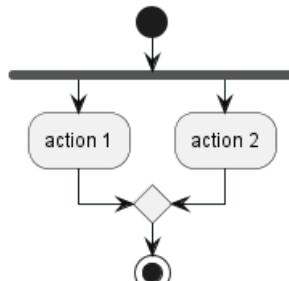
### 6.10.1 Simple fork

```
@startuml
start
fork
    :action 1;
fork again
    :action 2;
end fork
stop
@enduml
```



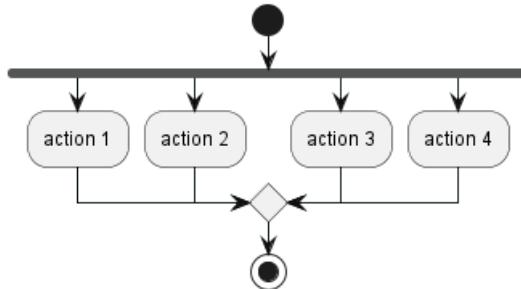
### 6.10.2 fork with end merge

```
@startuml
start
fork
    :action 1;
fork again
    :action 2;
end merge
stop
@enduml
```

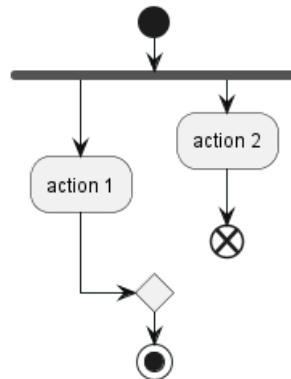


[Ref. QA-5320]

```
@startuml
start
fork
    :action 1;
fork again
    :action 2;
fork again
    :action 3;
fork again
    :action 4;
end merge
stop
@enduml
```



```
@startuml
start
fork
    :action 1;
fork again
    :action 2;
    end
end merge
stop
@enduml
```



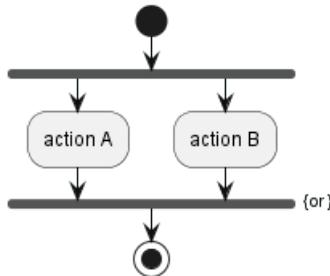
[Ref. QA-13731]

### 6.10.3 Label on end fork (or UML joinspec):

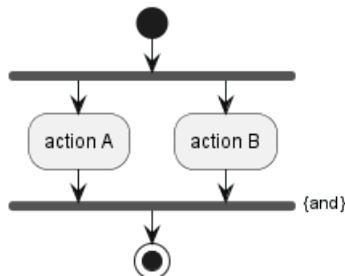
```
@startuml
start
fork
    :action A;
fork again
```



```
:action B;
end fork {or}
stop
@enduml
```



```
@startuml
start
fork
    :action A;
fork again
    :action B;
end fork {and}
stop
@enduml
```



[Ref. QA-5346]

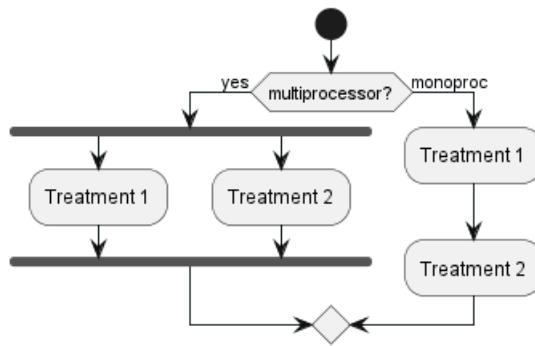
#### 6.10.4 Other example

```
@startuml
start

if (multiprocessor?) then (yes)
    fork
        :Treatment 1;
    fork again
        :Treatment 2;
    end fork
else (monoproc)
    :Treatment 1;
    :Treatment 2;
endif

@enduml
```



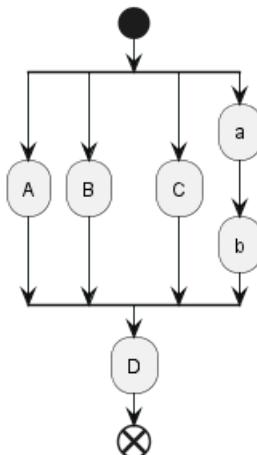


## 6.11 Split processing

### 6.11.1 Split

You can use `split`, `split again` and `end split` keywords to denote split processing.

```
@startuml
start
split
  :A;
split again
  :B;
split again
  :C;
split again
  :a;
  :b;
end split
:D;
end
@enduml
```



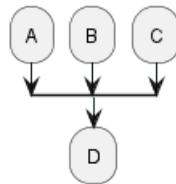
### 6.11.2 Input split (multi-start)

You can use `hidden` arrows to make an input split (multi-start):

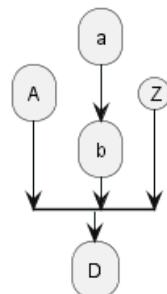
```
@startuml
split
  -[hidden]->
  :A;
split again
  -[hidden]->
```



```
:B;
split again
-[hidden]->
:C;
end split
:D;
@enduml
```



```
@startuml
split
-[hidden]->
:A;
split again
-[hidden]->
:a;
:b;
split again
-[hidden]->
(Z)
end split
:D;
@enduml
```



[Ref. QA-8662]

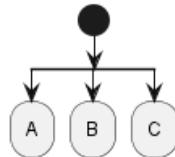
### 6.11.3 Output split (multi-end)

You can use `kill` or `detach` to make an output split (multi-end):

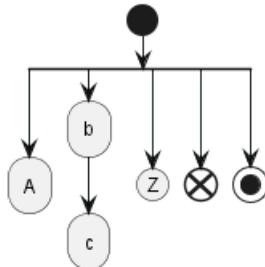
```
@startuml
start
split
:A;
kill
split again
:B;
detach
split again
:C;
kill
```



```
end split
@enduml
```



```
@startuml
start
split
: A;
kill
split again
: b;
: c;
detach
split again
(Z)
detach
split again
end
split again
stop
end split
@enduml
```



## 6.12 Notes

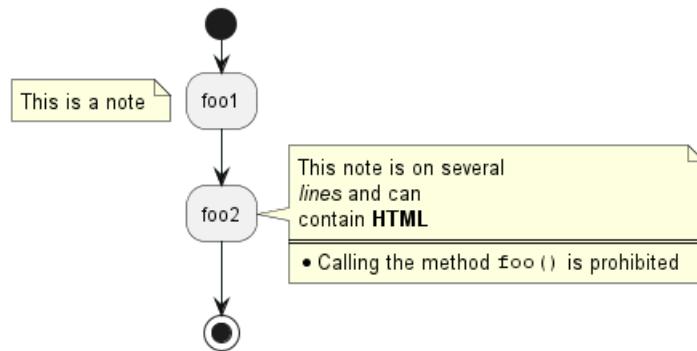
Text formatting can be done using creole wiki syntax.

A note can be floating, using `floating` keyword.

```
@startuml

start
:foo1;
floating note left: This is a note
:foo2;
note right
  This note is on several
  //lines// and can
  contain <b>HTML</b>
  ====
  * Calling the method ""foo()"" is prohibited
end note
stop

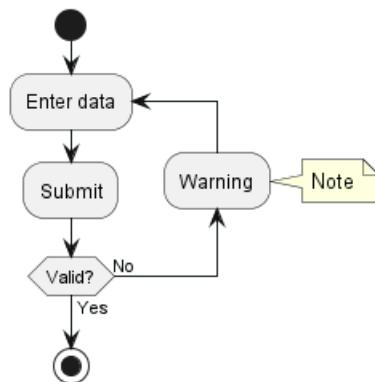
@enduml
```



You can add note on backward activity:

```

@startuml
start
repeat :Enter data;
:Submit;
backward :Warning;
note right: Note
repeat while (Valid?) is (No) not (Yes)
stop
@enduml
  
```



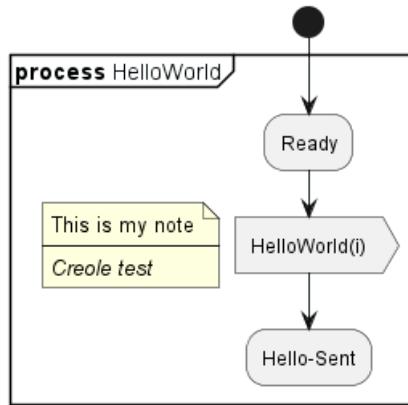
[Ref. QA-11788]

You can add note on partition activity:

```

@startuml
start
partition "***process** HelloWorld" {
    note
        This is my note
        ----
        //Creole test//
    end note
    :Ready;
    :HelloWorld(i)>
    :Hello-Sent;
}
@enduml
  
```





[Ref. QA-2398]

## 6.13 Colors

You can specify a color for some activities.

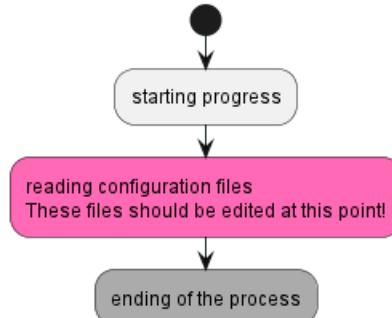
@startuml

```

start
:starting progress;
#HotPink:reading configuration files
These files should be edited at this point!;
#AAAAAA:ending of the process;

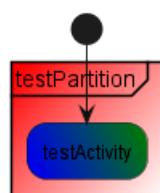
```

@enduml



You can also use gradient color.

@startuml  
start  
partition #red/white testPartition {  
 #blue\green:testActivity;  
}  
@enduml



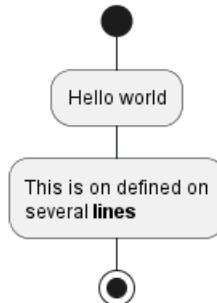
[Ref. QA-4906]



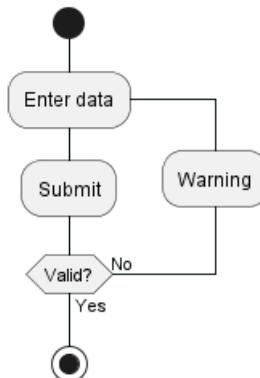
## 6.14 Lines without arrows

You can use `skinparam ArrowHeadColor none` in order to connect activities using lines only, without arrows.

```
@startuml
skinparam ArrowHeadColor none
start
:Hello world;
:This is on defined on
several **lines**;
stop
@enduml
```



```
@startuml
skinparam ArrowHeadColor none
start
repeat :Enter data;
:Submit;
backward :Warning;
repeat while (Valid?) is (No) not (Yes)
stop
@enduml
```



## 6.15 Arrows

Using the `->` notation, you can add texts to arrow, and change their color.

It's also possible to have dotted, dashed, bold or hidden arrows.

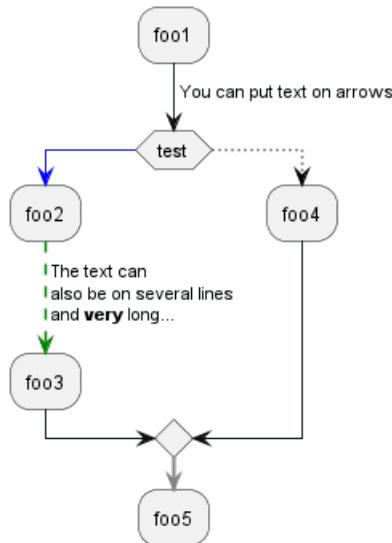
```
@startuml
:foo1;
-> You can put text on arrows;
if (test) then
-[#blue]->
:foo2;
-[#green,dashed]-> The text can
```



```

also be on several lines
and **very** long...;
:foo3;
else
-[#black,dotted]->
:foo4;
endif
-[#gray,bold]->
:foo5;
@enduml

```



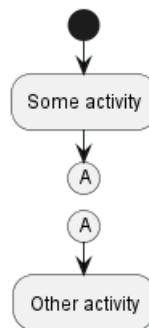
## 6.16 Connector

You can use parentheses to denote connector.

```

@startuml
start
:Some activity;
(A)
detach
(A)
:Other activity;
@enduml

```



## 6.17 Color on connector

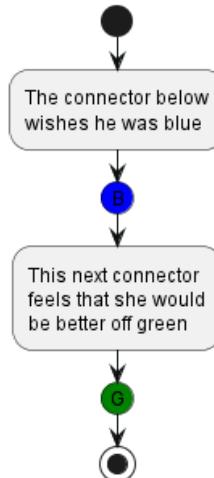
You can add color on connector.

```
@startuml
```

```

start
:The connector below
wishes he was blue;
#blue:(B)
:This next connector
feels that she would
be better off green;
#ggreen:(G)
stop
@enduml

```



[Ref. QA-10077]

## 6.18 Grouping or partition

### 6.18.1 Group

You can group activity together by defining group:

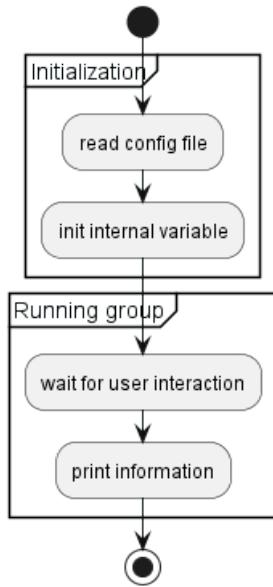
```

@startuml
start
group Initialization
    :read config file;
    :init internal variable;
end group
group Running group
    :wait for user interaction;
    :print information;
end group

stop
@enduml

```





### 6.18.2 Partition

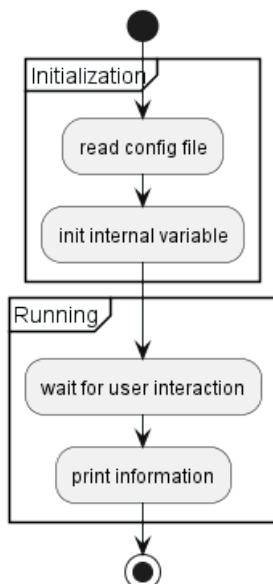
You can group activity together by defining partition:

```

@startuml
start
partition Initialization {
    :read config file;
    :init internal variable;
}
partition Running {
    :wait for user interaction;
    :print information;
}

stop
@enduml

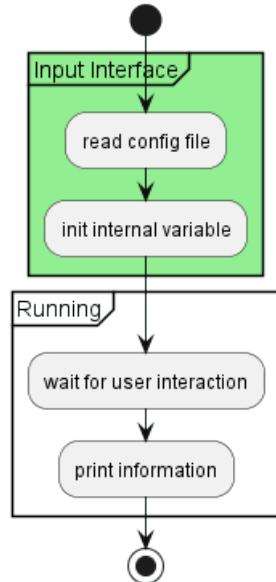
```



It's also possible to change partition color:



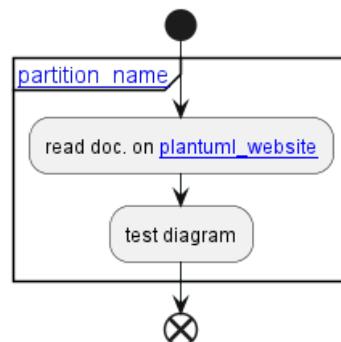
```
@startuml
start
partition #lightGreen "Input Interface" {
    :read config file;
    :init internal variable;
}
partition Running {
    :wait for user interaction;
    :print information;
}
stop
@enduml
```



[Ref. QA-2793]

It's also possible to add link to partition:

```
@startuml
start
partition "[[http://plantuml.com partition_name]]" {
    :read doc. on [[http://plantuml.com plantuml_website]];
    :test diagram;
}
end
@enduml
```



[Ref. QA-542]



### 6.18.3 Group, Partition, Package, Rectangle or Card

You can group activity together by defining:

- group;
- partition;
- package;
- rectangle;
- card.

```
@startuml
start
group Group
    :Activity;
end group
floating note: Note on Group

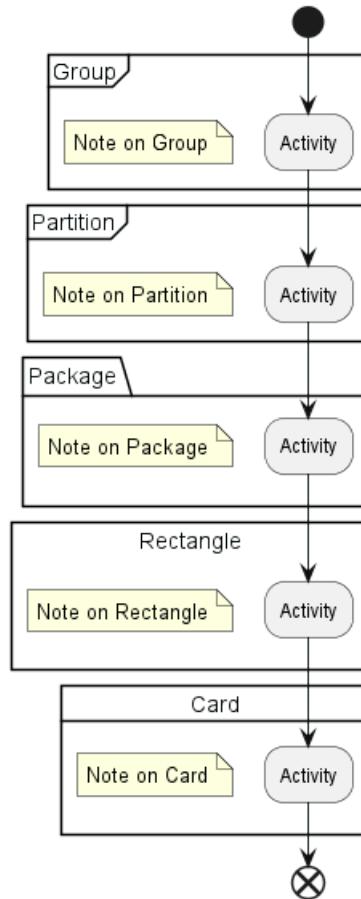
partition Partition {
    :Activity;
}
floating note: Note on Partition

package Package {
    :Activity;
}
floating note: Note on Package

rectangle Rectangle {
    :Activity;
}
floating note: Note on Rectangle

card Card {
    :Activity;
}
floating note: Note on Card
end
@enduml
```





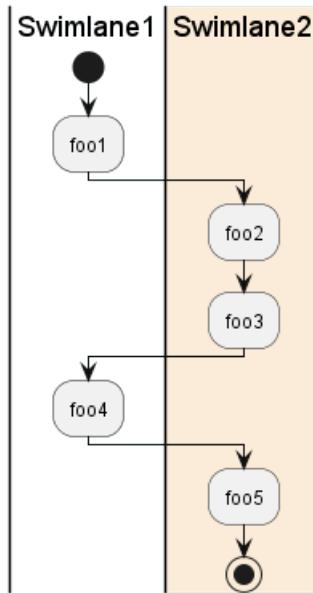
## 6.19 Swinlanes

Using pipe |, you can define swimlanes.

It's also possible to change swimlanes color.

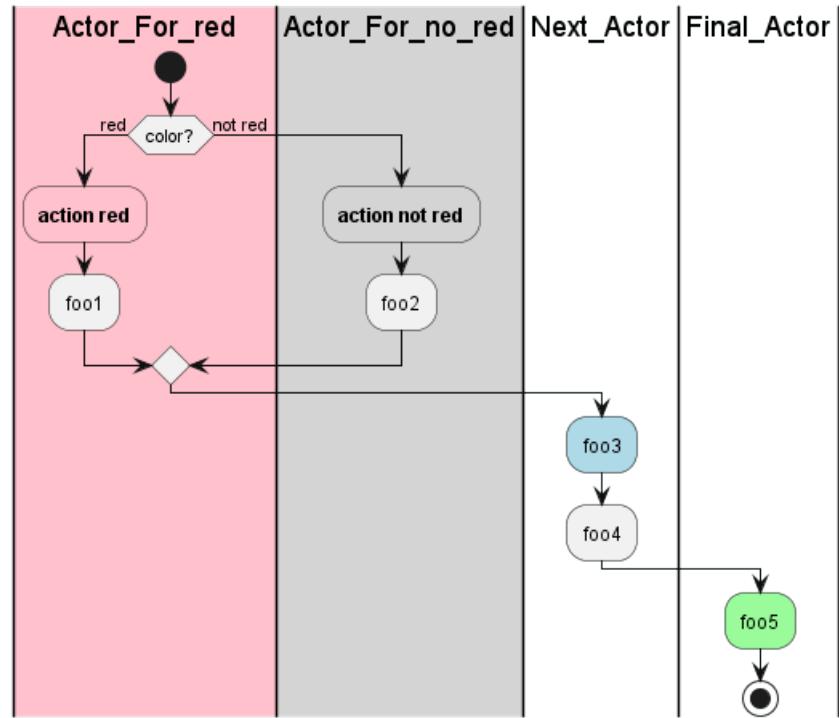
```
@startuml
|Swimlane1|
start
:foo1;
|#AntiqueWhite|Swimlane2|
:foo2;
:foo3;
|Swimlane1|
:foo4;
|Swimlane2|
:foo5;
stop
@enduml
```





You can add `if` conditional or `repeat` or `while` loop within swimlanes.

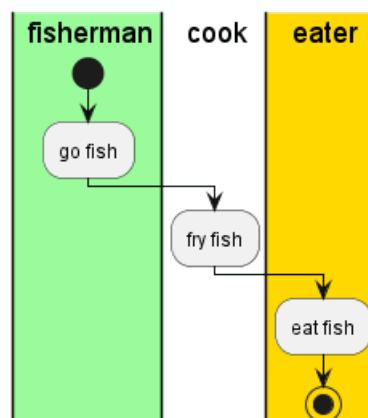
```
@startuml
|#pink|Actor_For_red|
start
if (color?) is (red) then
#pink:**action red**;
:foo1;
else (not red)
|#lightgray|Actor_For_no_red|
#lightgray:**action not red**;
:foo2;
endif
|Next_Actor|
#lightblue:foo3;
:foo4;
|Final_Actor|
#palegreen:foo5;
stop
@enduml
```



You can also use **alias** with swimlanes, with this syntax:

- |[#<color>|]<swimlane\_alias>| <swimlane\_title>

```
@startuml
|#palegreen|f| fisherman
|c| cook
|#gold|e| eater
|f|
start
:go fish;
|c|
:fry fish;
|e|
:eat fish;
stop
@enduml
```



[Ref. QA-2681]

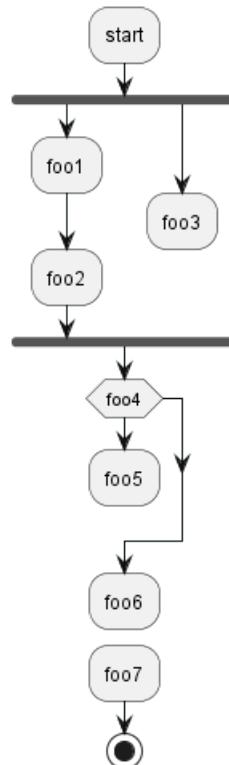


## 6.20 Detach or kill [detach, kill]

It's possible to remove an arrow using the `detach` or `kill` keyword:

- `detach`

```
@startuml
:start;
fork
  :foo1;
  :foo2;
fork again
  :foo3;
  detach
endfork
if (foo4) then
  :foo5;
  detach
endif
:foo6;
detach
:foo7;
stop
@enduml
```



- `kill`

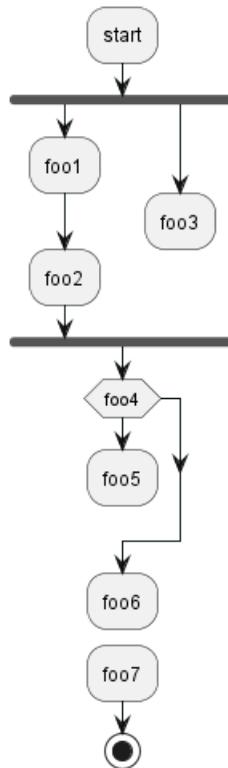
```
@startuml
:start;
fork
  :foo1;
  :foo2;
fork again
  :foo3;
  kill
```



```

endfork
if (foo4) then
  :foo5;
  kill
endif
:foo6;
kill
:foo7;
stop
@enduml

```



## 6.21 SDL (Specification and Description Language)

### 6.21.1 Table of SDL Shape Name

Name	Old syntax	Stereotype syntax
Input	<	<<input>>
Output	>	<<output>>
Procedure		<<procedure>>
Load	\	<<load>>
Save	/	<<save>>
Continuous	}	<<continuous>>
Task	]	<<task>>

[Ref. QA-11518, GH-1270]

### 6.21.2 SDL using final separator (Deprecated form)

By changing the final ; separator, you can set different rendering for the activity:

- |
- <
- >

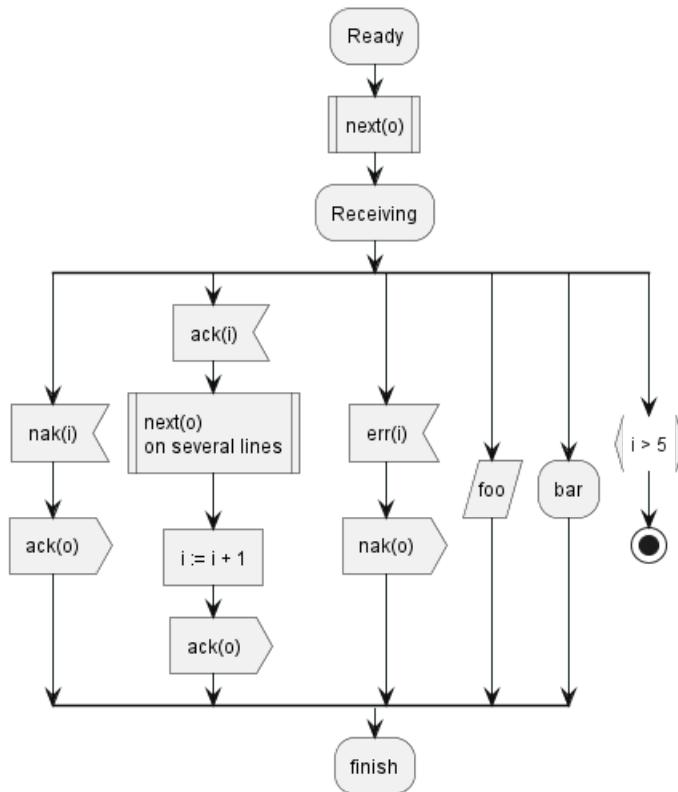


```

• /
• \\
• ]
• }

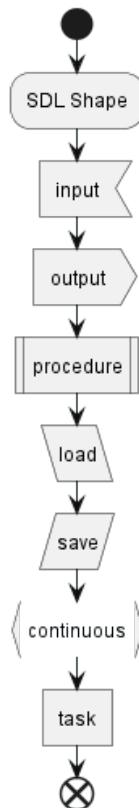
@startuml
:Ready;
:next(o)|
:Receiving;
split
  :nak(i)<
  :ack(o)>
split again
  :ack(i)<
  :next(o)
on several lines|
  :i := i + 1]
  :ack(o)>
split again
  :err(i)<
  :nak(o)>
split again
  :foo/
split again
  :bar\\
split again
  :i > 5}
stop
end split
:finish;
@enduml

```



### 6.21.3 SDL using Normal separator and Stereotype (Current official form)

```
@startuml
start
:SDL Shape;
:input; <<input>>
:output; <<output>>
:procedure; <<procedure>>
:load; <<load>>
:save; <<save>>
:continuous; <<continuous>>
:task; <<task>>
end
@enduml
```



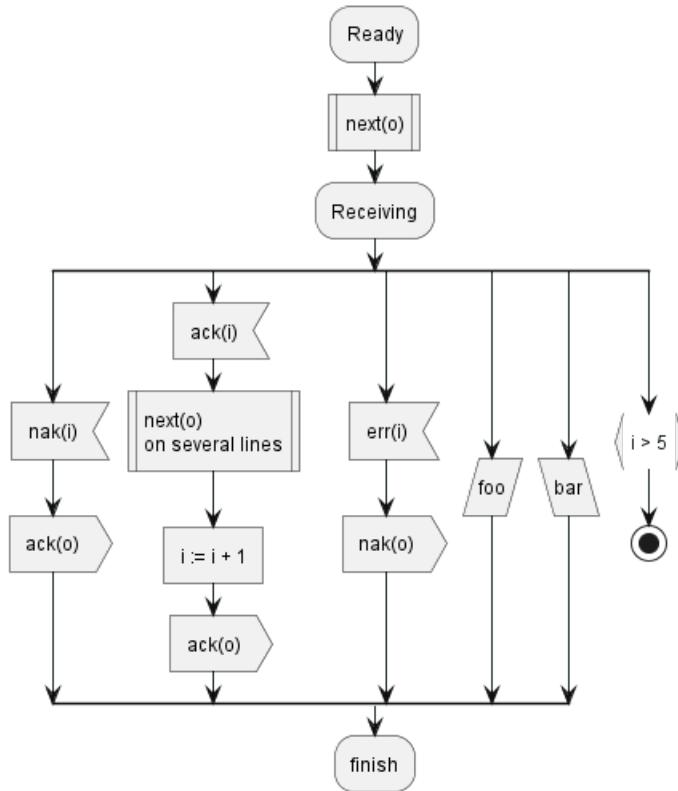
```
@startuml
:Ready;
:next(o); <<procedure>>
:Receiving;
split
  :nak(i); <<input>>
  :ack(o); <<output>>
split again
  :ack(i); <<input>>
  :next(o)
on several lines; <<procedure>>
  :i := i + 1; <<task>>
  :ack(o); <<output>>
split again
  :err(i); <<input>>
  :nak(o); <<output>>
split again
  :foo; <<save>>
```



```

split again
:bar; <<load>>
split again
:i > 5; <<continuous>>
stop
end split
:finish;
@enduml

```



## 6.22 Complete example

```

@startuml

start
:ClickServlet.handleRequest();
:new page;
if (Page.onSecurityCheck) then (true)
:Page.onInit();
if (isForward?) then (no)
:Process controls;
if (continue processing?) then (no)
stop
endif

if (isPost?) then (yes)
:Page.onPost();
else (no)
:Page.onGet();
endif
:Page.onRender();
endif
else (false)

```



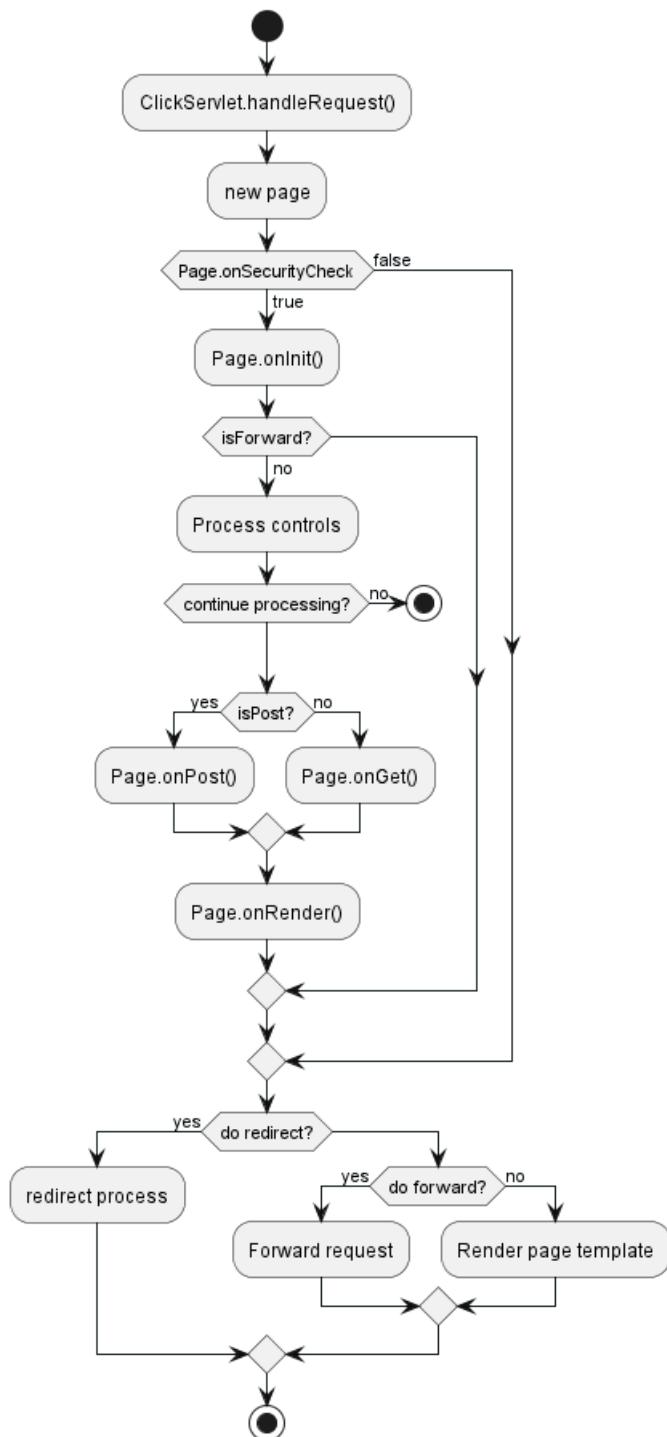
```
endif

if (do redirect?) then (yes)
    :redirect process;
else
    if (do forward?) then (yes)
        :Forward request;
    else (no)
        :Render page template;
    endif
endif

stop

@enduml
```





## 6.23 Condition Style

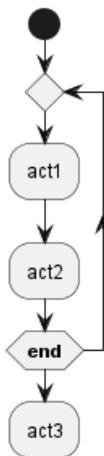
### 6.23.1 Inside style (by default)

```

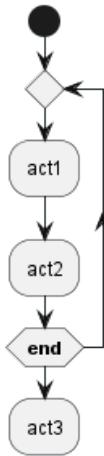
@startuml
skinparam conditionStyle inside
start
repeat
    :act1;
    :act2;
repeatwhile (<b>end</b>)
    :act3;
    
```



```
@enduml
```



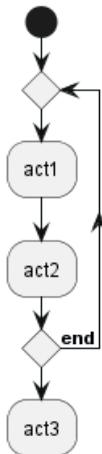
```
@startuml
start
repeat
    :act1;
    :act2;
repeatwhile (<b>end</b>)
    :act3;
@enduml
```



### 6.23.2 Diamond style

```
@startuml
skinparam conditionStyle diamond
start
repeat
    :act1;
    :act2;
repeatwhile (<b>end</b>)
    :act3;
@enduml
```



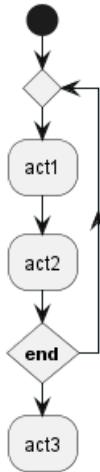


### 6.23.3 InsideDiamond (or *Foo1*) style

```

@startuml
skinparam conditionStyle InsideDiamond
start
repeat
    :act1;
    :act2;
repeatwhile (<b>end</b>)
    :act3;
@enduml

```

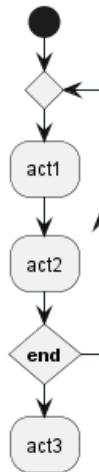


```

@startuml
skinparam conditionStyle foo1
start
repeat
    :act1;
    :act2;
repeatwhile (<b>end</b>)
    :act3;
@enduml

```





[Ref. QA-1290 and #400]

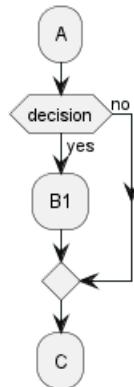
## 6.24 Condition End Style

### 6.24.1 Diamond style (by default)

- With one branch

```

@startuml
skinparam ConditionEndStyle diamond
:A;
if (decision) then (yes)
  :B1;
else (no)
endif
:C;
@enduml
  
```

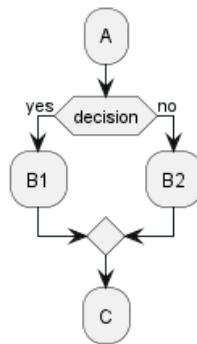


- With two branches (B1, B2)

```

@startuml
skinparam ConditionEndStyle diamond
:A;
if (decision) then (yes)
  :B1;
else (no)
  :B2;
endif
:C;
@enduml
@enduml
  
```



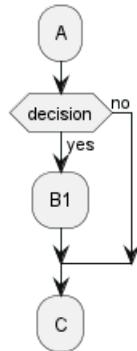


### 6.24.2 Horizontal line (hline) style

- With one branch

```

@startuml
skinparam ConditionEndStyle hline
:A;
if (decision) then (yes)
  :B1;
else (no)
endif
:C;
@enduml
  
```

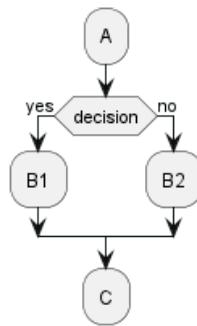


- With two branches (B1, B2)

```

@startuml
skinparam ConditionEndStyle hline
:A;
if (decision) then (yes)
  :B1;
else (no)
  :B2;
endif
:C;
@enduml
  
```





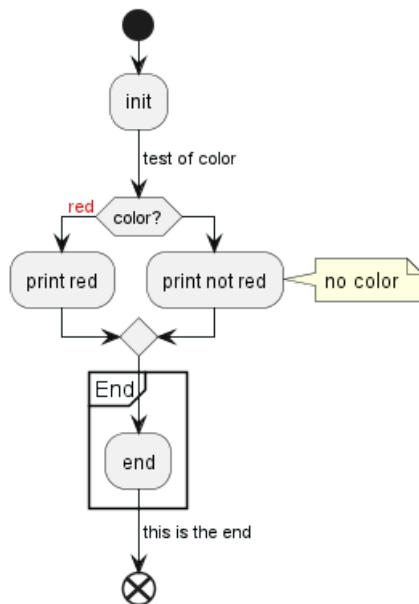
[Ref. QA-4015]

## 6.25 Using (global) style

### 6.25.1 Without style (by default)

```

@startuml
start
:init;
-> test of color;
if (color?) is (<color:red>red) then
:print red;
else
:print not red;
note right: no color
endif
partition End {
:end;
}
-> this is the end;
end
@enduml
  
```



### 6.25.2 With style

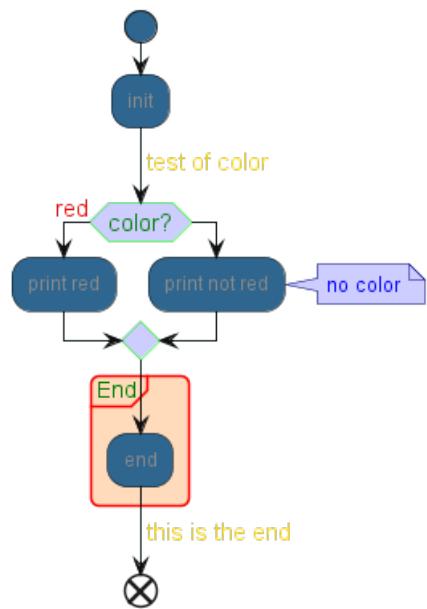
You can use style to change rendering of elements.

```
@startuml
```

```
<style>
activityDiagram {
    BackgroundColor #33668E
    BorderColor #33668E
    FontColor #888
    FontName arial

    diamond {
        BackgroundColor #ccf
        LineColor #00FF00
        FontColor green
        FontName arial
        FontSize 15
    }
    arrow {
        FontColor gold
        FontName arial
        FontSize 15
    }
    partition {
        LineColor red
        FontColor green
        RoundCorner 10
        BackgroundColor PeachPuff
    }
    note {
        FontColor Blue
        LineColor Navy
        BackgroundColor #ccf
    }
}
document {
    BackgroundColor transparent
}
</style>
start
: init;
-> test of color;
if (color?) is (<color:red>red) then
: print red;
else
: print not red;
note right: no color
endif
partition End {
: end;
}
-> this is the end;
end
@enduml
```





## 7 Component Diagram

**Component Diagram:** A component diagram is a type of structural diagram used in UML (Unified Modeling Language) to visualize the organization and relationships of system components. These diagrams help in breaking down complex systems into manageable components, showcasing their inter-dependencies, and ensuring efficient system design and architecture.

### Advantages of PlantUML:

- **Simplicity:** With PlantUML, you can create component diagrams using simple and intuitive text-based descriptions, eliminating the need for complex drawing tools.
- **Integration:** PlantUML seamlessly integrates with various tools and platforms, making it a versatile choice for developers and architects.
- **Collaboration:** The PlantUML forum offers a platform for users to discuss, share, and seek assistance on their diagrams, fostering a collaborative community.

### 7.1 Components

Components must be bracketed.

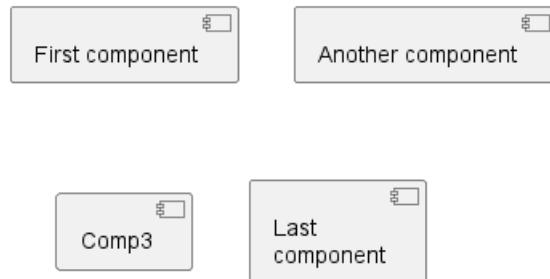
You can also use the `component` keyword to define a component. In this case the brackets can be omitted, but only if the component name does not include white-space or special characters.

You can define an alias, using the `as` keyword. This alias will be used later, when defining relations.

```
@startuml
```

```
[First component]
[Another component] as Comp2
component Comp3
component [Last\ncomponent] as Comp4
```

```
@enduml
```



#### 7.1.1 Naming exceptions

Note that component names starting with \$ cannot be hidden or removed later, because `hide` and `remove` command will consider the name a `$tag` instead of a component name. To later remove such component they must have an alias or must be tagged.

```
@startuml
component [$C1]
component [$C2] $C2
component [$C2] as dollarC2
remove $C1
remove $C2
remove dollarC2
@enduml
```



## 7.2 Interfaces

Interface can be defined using the () symbol (because this looks like a circle).

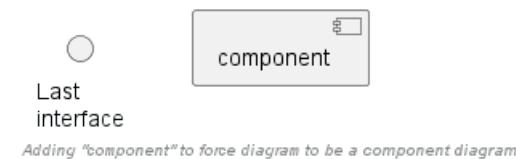
You can also use the `interface` keyword to define an interface. And you can define an alias, using the `as` keyword. This alias will be used latter, when defining relations.

We will see latter that interface definition is optional.

```
@startuml
```

```
() "First Interface"
() "Another interface" as Interf2
interface Interf3
interface "Last\ninterface" as Interf4

[component]
footer //Adding "component" to force diagram to be a **component diagram**//
@enduml
```



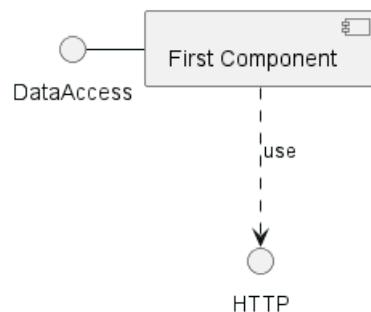
## 7.3 Basic example

Links between elements are made using combinations of dotted line (..), straight line (--), and arrows (-->) symbols.

```
@startuml
```

```
DataAccess - [First Component]
[First Component] ..> HTTP : use
```

```
@enduml
```



## 7.4 Using notes

You can use the `note left of`, `note right of`, `note top of`, `note bottom of` keywords to define notes related to a single object.

```
@startuml
[Component] as C
```

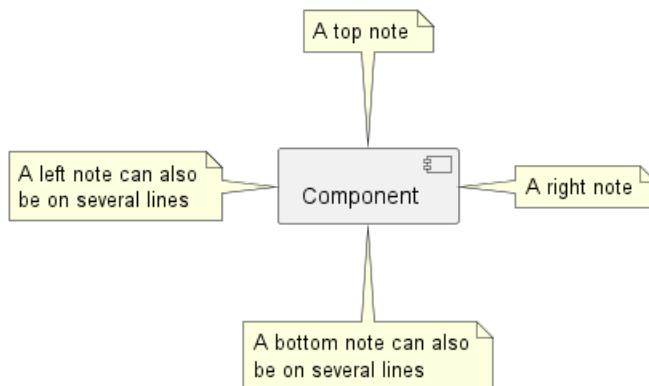


```
note top of C: A top note
```

```
note bottom of C
A bottom note can also
be on several lines
end note
```

```
note left of C
A left note can also
be on several lines
end note
```

```
note right of C: A right note
@enduml
```

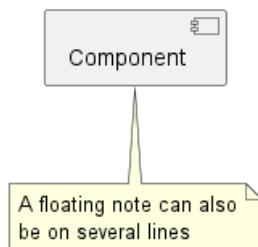


A note can be also defined alone with the `note` keywords, then linked to other objects using the `..` symbol or whatever arrow symbol (`-`, `--`, ...).

```
@startuml
[Component] as C
```

```
note as N
A floating note can also
be on several lines
end note
```

```
C .. N
@enduml
```



Another note example:

```
@startuml

interface "Data Access" as DA

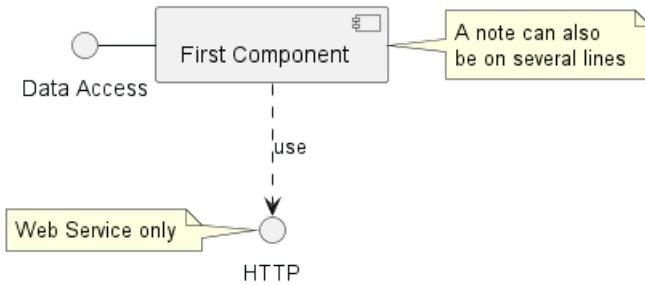
DA - [First Component]
[First Component] ..> HTTP : use
```



```
note left of HTTP : Web Service only
```

```
note right of [First Component]
A note can also
be on several lines
end note
```

```
@enduml
```



## 7.5 Grouping Components

You can use several keywords to group components and interfaces together:

- package
- node
- folder
- frame
- cloud
- database

```
@startuml
```

```

package "Some Group" {
    HTTP - [First Component]
    [Another Component]
}

node "Other Groups" {
    FTP - [Second Component]
    [First Component] --> FTP
}

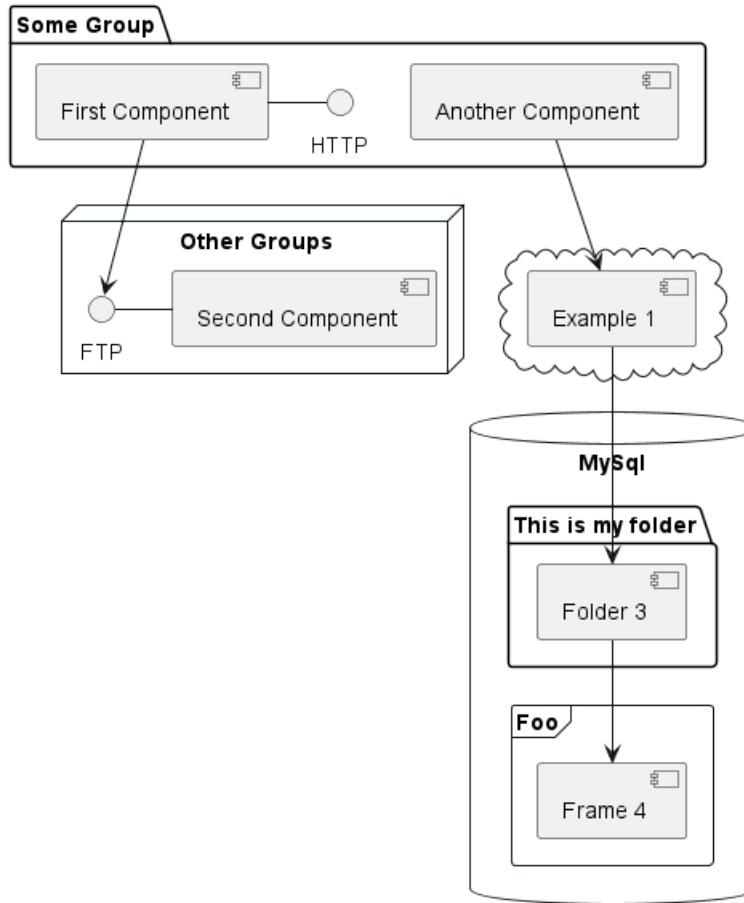
cloud {
    [Example 1]
}

database "MySql" {
    folder "This is my folder" {
        [Folder 3]
    }
    frame "Foo" {
        [Frame 4]
    }
}
  
```



```
[Another Component] --> [Example 1]
[Example 1] --> [Folder 3]
[Folder 3] --> [Frame 4]
```

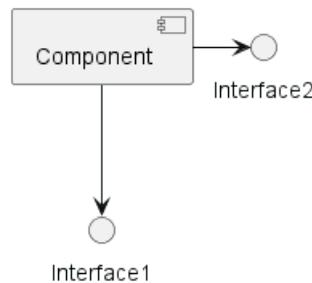
@enduml



## 7.6 Changing arrows direction

By default, links between classes have two dashes -- and are vertically oriented. It is possible to use horizontal link by putting a single dash (or dot) like this:

```
@startuml
[Component] --> Interface1
[Component] -> Interface2
@enduml
```

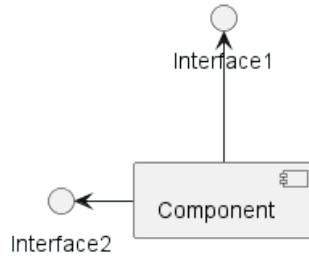


You can also change directions by reversing the link:

@startuml

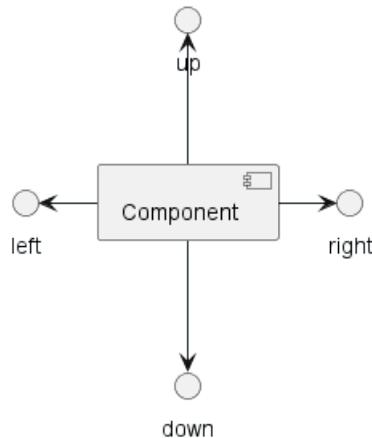


```
Interface1 <-- [Component]
Interface2 <- [Component]
@enduml
```



It is also possible to change arrow direction by adding `left`, `right`, `up` or `down` keywords inside the arrow:

```
@startuml
[Component] -left-> left
[Component] -right-> right
[Component] -up-> up
[Component] -down-> down
@enduml
```



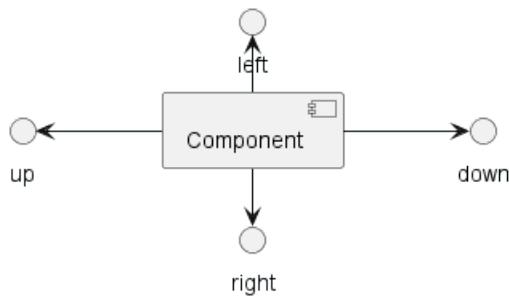
You can shorten the arrow by using only the first character of the direction (for example, `-d-` instead of `-down-`) or the two first characters (`-do-`).

Please note that you should not abuse this functionality : *Graphviz* gives usually good results without tweaking.

And with the `left to right direction` parameter:

```
@startuml
left to right direction
[Component] -left-> left
[Component] -right-> right
[Component] -up-> up
[Component] -down-> down
@enduml
```





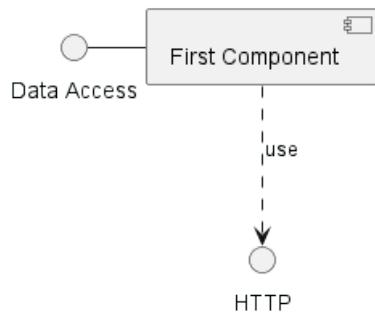
## 7.7 Use UML2 notation

By default (*from v1.2020.13-14*), UML2 notation is used.

```
@startuml
```

```
interface "Data Access" as DA
DA - [First Component]
[First Component] ..> HTTP : use
```

```
@enduml
```



## 7.8 Use UML1 notation

The `skinparam componentStyle uml1` command is used to switch to UML1 notation.

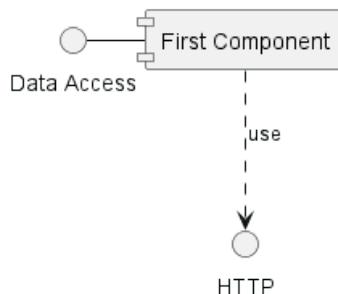
```
@startuml
```

```
skinparam componentStyle uml1
```

```
interface "Data Access" as DA
```

```
DA - [First Component]
[First Component] ..> HTTP : use
```

```
@enduml
```



## 7.9 Use rectangle notation (remove UML notation)

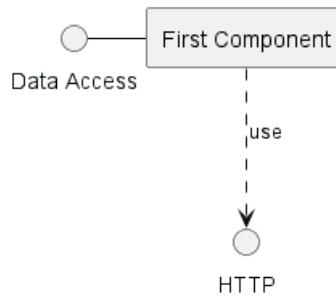
The `skinparam componentStyle rectangle` command is used to switch to rectangle notation (*without any UML notation*).

```
@startuml
skinparam componentStyle rectangle

interface "Data Access" as DA

DA - [First Component]
[First Component] ..> HTTP : use

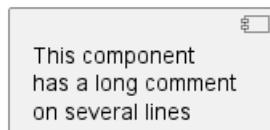
@enduml
```



## 7.10 Long description

It is possible to put description on several lines using square brackets.

```
@startuml
component comp1 [
This component
has a long comment
on several lines
]
@enduml
```



## 7.11 Individual colors

You can specify a color after component definition.

```
@startuml
component [Web Server] #Yellow
@enduml
```



## 7.12 Using Sprite in Stereotype

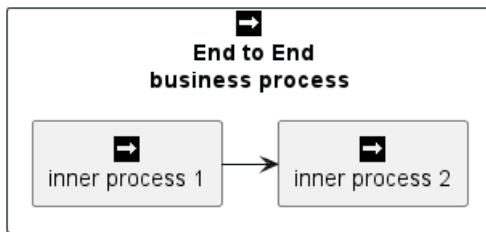
You can use sprites within stereotype components.

```
@startuml
sprite $businessProcess [16x16/16] {
```



```
FFFFFFFFFFFFFF
FFFFFFFFFFFFFF
FFFFFFFFFFFFFF
FFFFFFFFFFFFFF
FFFFFFFFFFFFFOFFFF
FFFFFFFFFOOFFFF
FF000000000000FFF
FF0000000000000FF
FF000000000000FFF
FFFFFFFFFFFOOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
FFFFFFFFFFFOFFFF
}
}
```

```
rectangle " End to End\nbusiness process" <<$businessProcess>> {
    rectangle "inner process 1" <<$businessProcess>> as src
    rectangle "inner process 2" <<$businessProcess>> as tgt
    src -> tgt
}
@enduml
```



## 7.13 Skinparam

You can use the skinparam command to change colors and fonts for the drawing.

You can use this command :

- In the diagram definition, like any other commands;
- In an included file;
- In a configuration file, provided in the command line or the Ant task.

You can define specific color and fonts for stereotyped components and interfaces.

```
@startuml
```

```
skinparam interface {
    backgroundColor RosyBrown
    borderColor orange
}

skinparam component {
    FontSize 13
    BackgroundColor<<Apache>> Pink
    BorderColor<<Apache>> #FF6655
    FontName Courier
    BorderColor black
```

```

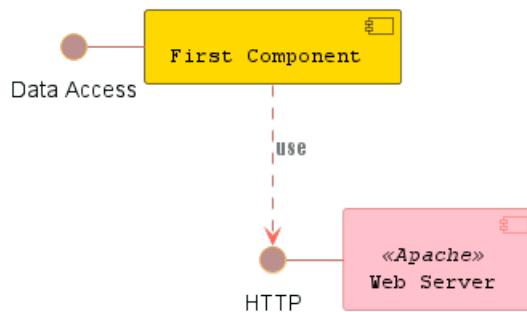
BackgroundColor gold
ArrowFontName Impact
ArrowColor #FF6655
ArrowFontColor #777777
}

() "Data Access" as DA
Component "Web Server" as WS << Apache >>

DA - [First Component]
[First Component] ..> () HTTP : use
HTTP - WS

@enduml

```



```
@startuml
```

```

skinparam component {
    backgroundColor<<static lib>> DarkKhaki
    backgroundColor<<shared lib>> Green
}

skinparam node {
    borderColor Green
    backgroundColor Yellow
    backgroundColor<<shared_node>> Magenta
}
skinparam databaseBackgroundColor Aqua

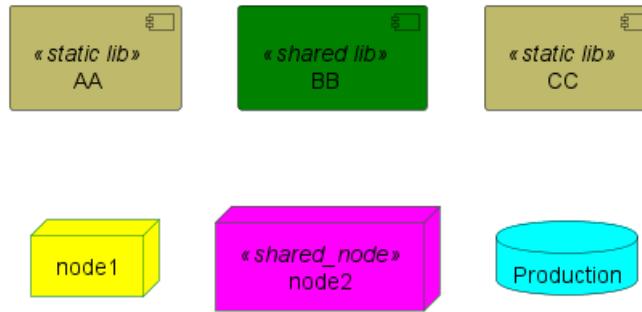
[AA] <<static lib>>
[BB] <<shared lib>>
[CC] <<static lib>>

node node1
node node2 <<shared_node>>
database Production

@enduml

```



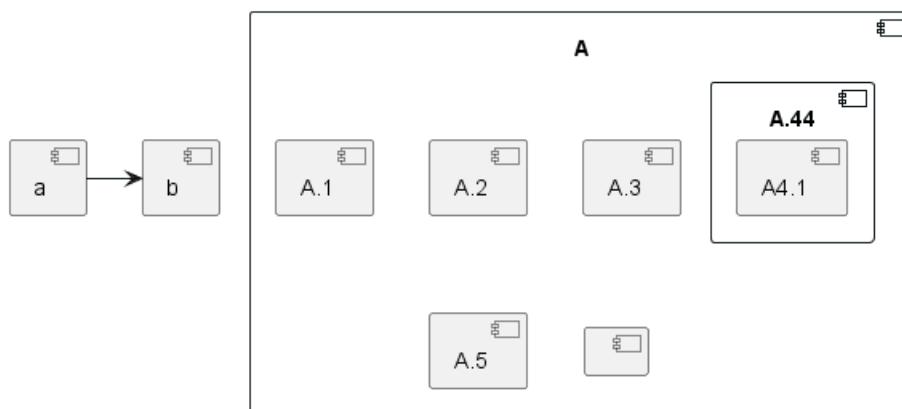


## 7.14 Specific SkinParameter

### 7.14.1 componentStyle

- By default (or with `skinparam componentStyle uml2`), you have an icon for component

```
@startuml
skinparam BackgroundColor transparent
skinparam componentStyle uml2
component A {
    component "A.1" {
    }
    component A.44 {
        [A4.1]
    }
    component "A.2"
    [A.3]
    component A.5 [
    A.5]
    component A.6 [
    ]
}
[a]->[b]
@enduml
```

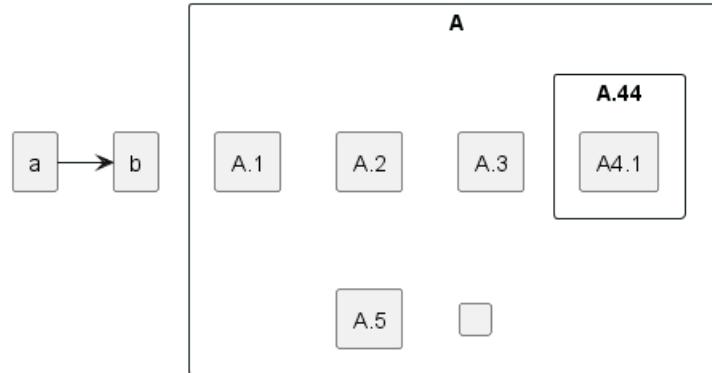


- If you want to suppress it, and to have only the rectangle, you can use `skinparam componentStyle rectangle`

```
@startuml
skinparam BackgroundColor transparent
skinparam componentStyle rectangle
component A {
    component "A.1" {
    }
}
component A.44 {
```



```
[A4.1]
}
component "A.2"
[A.3]
component A.5 [
A.5]
component A.6 [
]
}
[a]->[b]
@enduml
```

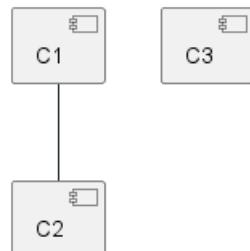


[Ref. 10798]

## 7.15 Hide or Remove unlinked component

By default, all components are displayed:

```
@startuml
component C1
component C2
component C3
C1 -- C2
@enduml
```



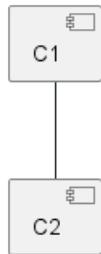
But you can:

- hide @unlinked components:

```
@startuml
component C1
component C2
component C3
C1 -- C2

hide @unlinked
@enduml
```





- or remove @unlinked components:

```

@startuml
component C1
component C2
component C3
C1 -- C2

remove @unlinked
@enduml

```



[Ref. QA-11052]

## 7.16 Hide, Remove or Restore tagged component or wildcard

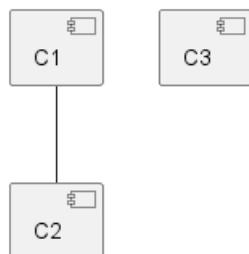
You can put \$tags (using \$) on components, then remove, hide or restore components either individually or by tags.

By default, all components are displayed:

```

@startuml
component C1 $tag13
component C2
component C3 $tag13
C1 -- C2
@enduml

```



But you can:

- hide \$tag13 components:

```

@startuml
component C1 $tag13
component C2
component C3 $tag13

```



C1 -- C2

```
hide $tag13
@enduml
```



- or remove \$tag13 components:

```
@startuml
component C1 $tag13
component C2
component C3 $tag13
C1 -- C2
```

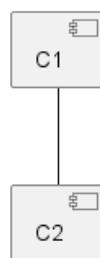
```
remove $tag13
@enduml
```



- or remove \$tag13 and restore \$tag1 components:

```
@startuml
component C1 $tag13 $tag1
component C2
component C3 $tag13
C1 -- C2
```

```
remove $tag13
restore $tag1
@enduml
```



- or remove \* and restore \$tag1 components:

```
@startuml
component C1 $tag13 $tag1
component C2
component C3 $tag13
C1 -- C2
```

```
remove *
restore $tag1
@enduml
```



[Ref. QA-7337 and QA-11052]

## 7.17 Display JSON Data on Component diagram

### 7.17.1 Simple example

```
@startuml
allowmixing

component Component
()           Interface

json JSON {
    "fruit":"Apple",
    "size":"Large",
    "color": ["Red", "Green"]
}
@enduml
```



JSON	
fruit	Apple
size	Large
color	Red
	Green

[Ref. QA-15481]

For another example, see on JSON page.

## 7.18 Port [port, portIn, portOut]

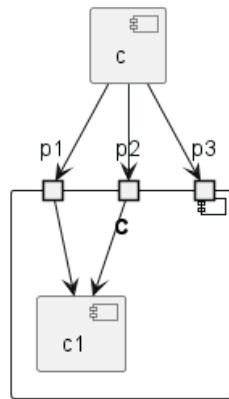
You can add **port** with **port**, **portIn** and **portOut** keywords.

### 7.18.1 Port

```
@startuml
[c]
component C {
    port p1
    port p2
    port p3
    component c1
}

c --> p1
c --> p2
c --> p3
p1 --> c1
p2 --> c1
@enduml
```



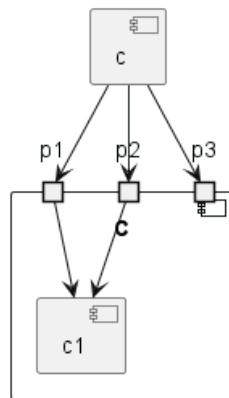


### 7.18.2 PortIn

```

@startuml
[c]
component C {
    portin p1
    portin p2
    portin p3
    component c1
}

c --> p1
c --> p2
c --> p3
p1 --> c1
p2 --> c1
@enduml
  
```



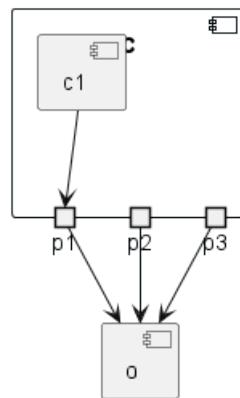
### 7.18.3 PortOut

```

@startuml
component C {
    portout p1
    portout p2
    portout p3
    component c1
}
[o]
p1 --> o
p2 --> o
p3 --> o
  
```



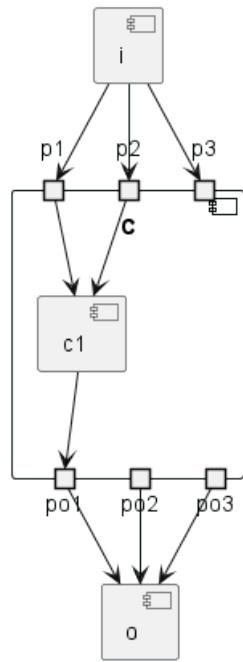
```
c1 --> p1  
@enduml
```



#### 7.18.4 Mixing PortIn & PortOut

```
@startuml  
[i]  
component C {  
    portin p1  
    portin p2  
    portin p3  
    portout po1  
    portout po2  
    portout po3  
    component c1  
}  
[o]  
  
i --> p1  
i --> p2  
i --> p3  
p1 --> c1  
p2 --> c1  
po1 --> o  
po2 --> o  
po3 --> o  
c1 --> po1  
@enduml
```





## 8 Deployment Diagram

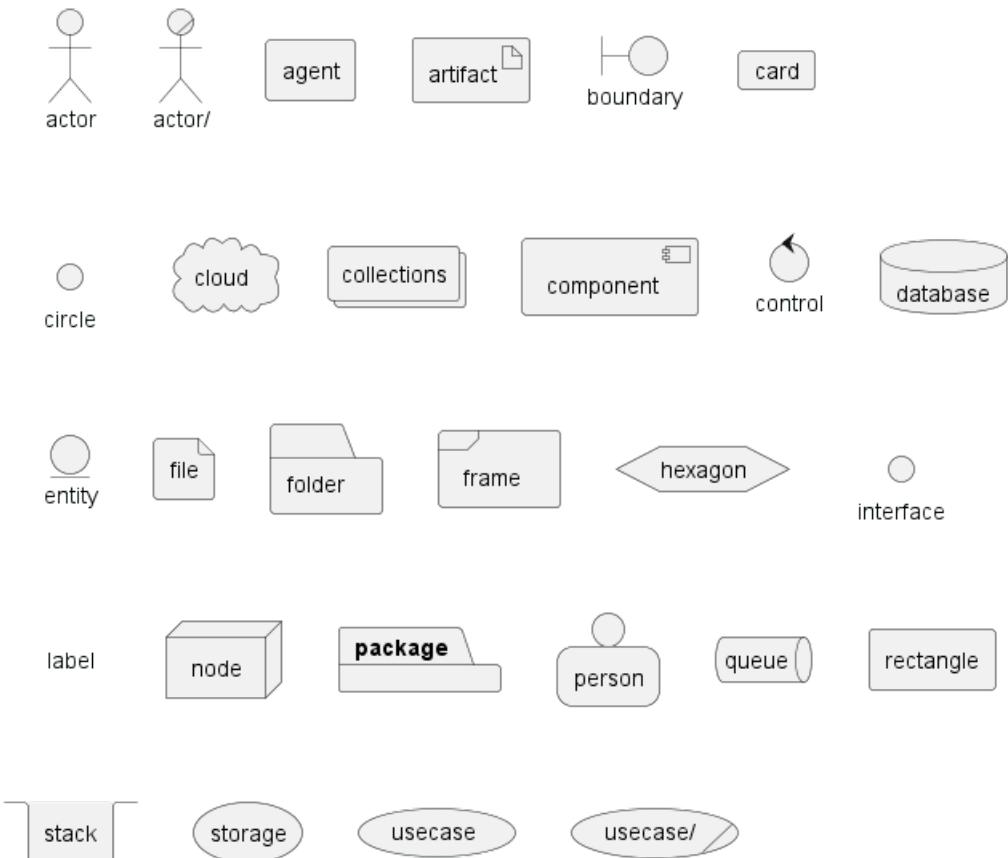
A **Deployment Diagram** is a type of diagram that visualizes the architecture of systems, showcasing how software components are deployed onto hardware. It provides a clear picture of the distribution of components across various nodes, such as servers, workstations, and devices.

With PlantUML, creating deployment diagrams becomes a breeze. The platform offers a simple and intuitive way to design these diagrams using plain text, ensuring rapid iterations and easy version control. Moreover, the PlantUML forum provides a vibrant community where users can seek help, share ideas, and collaborate on diagramming challenges. One of the key advantages of PlantUML is its ability to integrate seamlessly with various tools and platforms, making it a preferred choice for professionals and enthusiasts alike.

### 8.1 Declaring element

```
@startuml
actor actor
actor/ "actor/"
agent agent
artifact artifact
boundary boundary
card card
circle circle
cloud cloud
collections collections
component component
control control
database database
entity entity
file file
folder folder
frame frame
hexagon hexagon
interface interface
label label
node node
package package
person person
queue queue
rectangle rectangle
stack stack
storage storage
usecase usecase
usecase/ "usecase/"
@enduml
```





You can optionally put text using bracket [] for a long description.

```
@startuml
folder folder [
This is a <b>folder
-----
You can use separator
=====
of different kind
....
and style
]
```

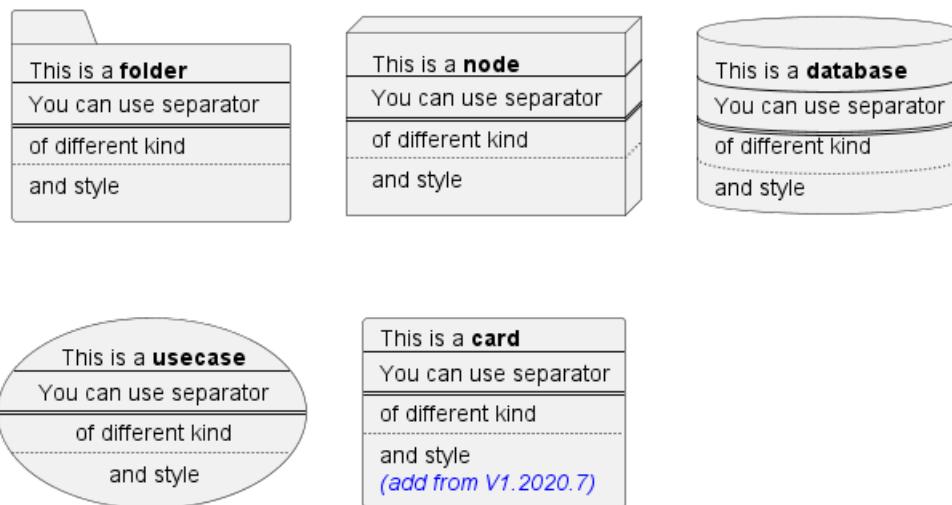
```
node node [
This is a <b>node
-----
You can use separator
=====
of different kind
....
and style
]
```

```
database database [
This is a <b>database
-----
You can use separator
=====
of different kind
....
and style
```



```
]
usecase usecase [
This is a <b>usecase
-----
You can use separator
=====
of different kind
....
and style
]
```

```
card card [
This is a <b>card
-----
You can use separator
=====
of different kind
....
and style
<i><color:blue>(add from V1.2020.7)</color></i>
]
@enduml
```



## 8.2 Declaring element (using short form)

We can declare element using some short forms.

Long form Keyword	Short form Keyword	Long form example	Short form example	Ref.
actor	: a :	actor actor1	:actor2:	Actors
component	[ c ]	component component1	[component2]	Components
interface	() i	interface interface1	() "interface2"	Interfaces
usecase	( u )	usecase usecase1	(usecase2)	Usecases

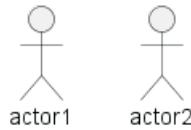
### 8.2.1 Actor

```
@startuml
```

```
actor actor1
:actor2:
```

```
@enduml
```





**NB:** There is an old syntax for actor with guillemet which is now deprecated and will be removed some days. Please do not use in your diagram.

### 8.2.2 Component

```
@startuml
```

```
component component1
[component2]
```

```
@enduml
```



### 8.2.3 Interface

```
@startuml
```

```
interface interface1
() "interface2"

label "//interface example//"
@enduml
```



*interface example*

### 8.2.4 Usecase

```
@startuml
```

```
usecase usecase1
(usecase2)
```

```
@enduml
```



## 8.3 Linking or arrow

You can create simple links between elements with or without labels:

```
@startuml
```

```
node node1
node node2
node node3
node node4
```

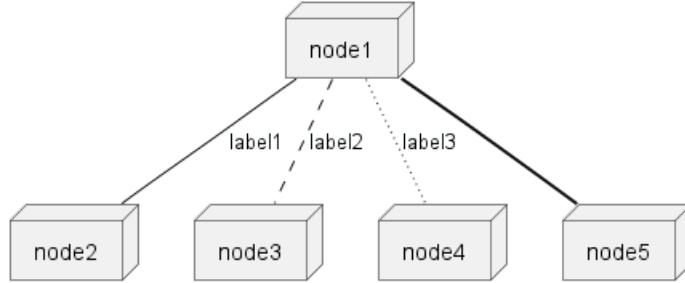


```

node node5
node1 -- node2 : label1
node1 .. node3 : label2
node1 ~~ node4 : label3
node1 == node5

@enduml

```



It is possible to use several types of links:

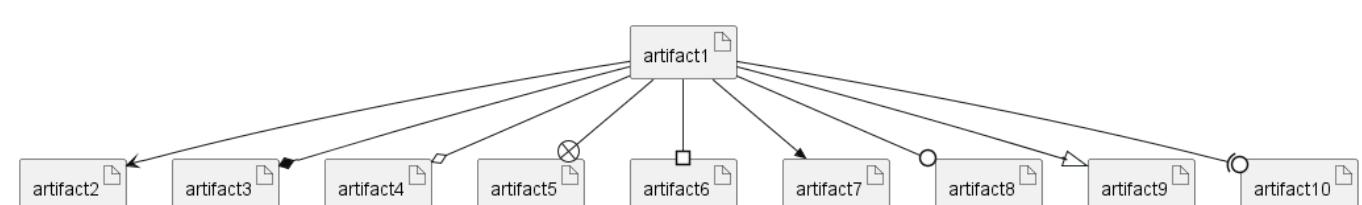
```

@startuml

artifact artifact1
artifact artifact2
artifact artifact3
artifact artifact4
artifact artifact5
artifact artifact6
artifact artifact7
artifact artifact8
artifact artifact9
artifact artifact10
artifact1 --> artifact2
artifact1 --* artifact3
artifact1 --o artifact4
artifact1 --+ artifact5
artifact1 --# artifact6
artifact1 -->> artifact7
artifact1 --o artifact8
artifact1 --^ artifact9
artifact1 --(0 artifact10

@enduml

```



You can also have the following types:

```
@startuml
```

```

cloud cloud1
cloud cloud2
cloud cloud3
cloud cloud4

```

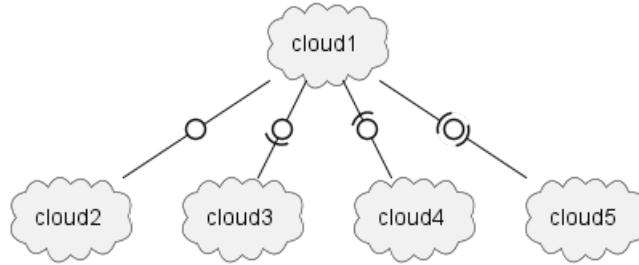


```

cloud cloud5
cloud1 -0- cloud2
cloud1 -0)- cloud3
cloud1 -(0- cloud4
cloud1 -(0)- cloud5

```

@enduml



or another example:

```

@startuml
actor foo1
actor foo2
foo1 <-0-> foo2
foo1 <-(0)-> foo2

```

```

(ac1) -le(0)-> left1
ac1 -ri(0)-> right1
ac1 .up(0).> up1
ac1 ~up(0)~> up2
ac1 -do(0)-> down1
ac1 -do(0)-> down2

```

actor1 -0)- actor2

```

component comp1
component comp2
comp1 *-0)--+ comp2
[comp3] <-->> [comp4]

```

```

boundary b1
control c1
b1 -(0)- c1

```

```

component comp1
interface interf1
comp1 #~~( interf1

```

```

:mode1actor: -0)- fooa1
:mode1actorl: -ri0)- foo1

```

```

[component1] 0)-(0-(0 [componentC]
() component3 )-0-(0 "foo" [componentC]

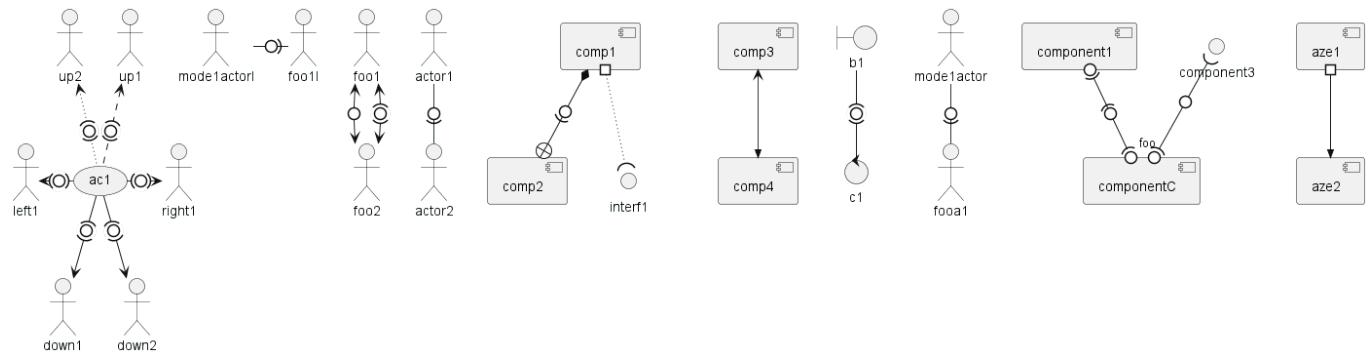
```

```

[aze1] #-->> [aze2]
@enduml

```





[Ref. QA-547 and QA-1736]

See all type on [Appendix](#).

## 8.4 Bracketed arrow style

*Similar as Bracketed class relations (linking or arrow) style*

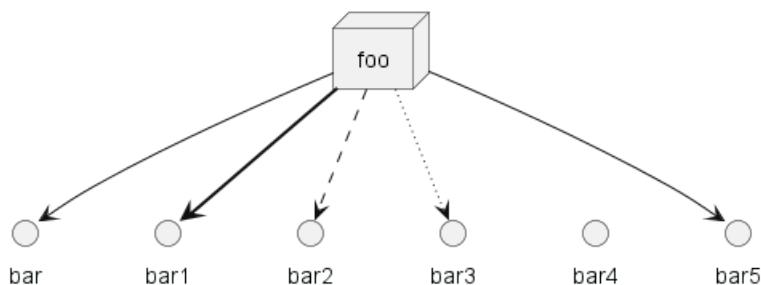
### 8.4.1 Line style

It's also possible to have explicitly **bold**, **dashed**, **dotted**, **hidden** or **plain** arrows:

- without label

```
@startuml
node foo
title Bracketed line style without label
foo --> bar
foo -[bold]-> bar1
foo -[dashed]-> bar2
foo -[dotted]-> bar3
foo -[hidden]-> bar4
foo -[plain]-> bar5
@enduml
```

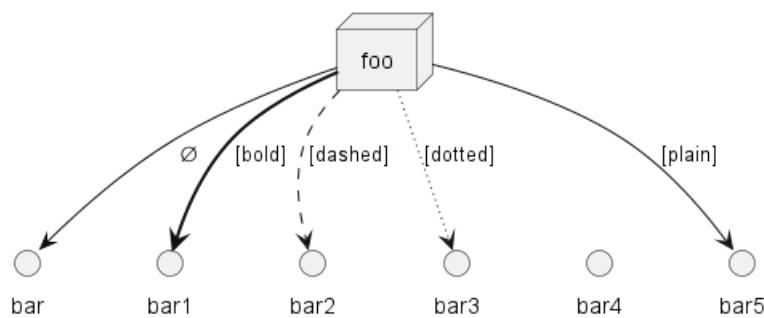
**Bracketed line style without label**



- with label

```
@startuml
title Bracketed line style with label
node foo
foo --> bar      :
foo -[bold]-> bar1 : [bold]
foo -[dashed]-> bar2 : [dashed]
foo -[dotted]-> bar3 : [dotted]
foo -[hidden]-> bar4 : [hidden]
foo -[plain]-> bar5 : [plain]
@enduml
```

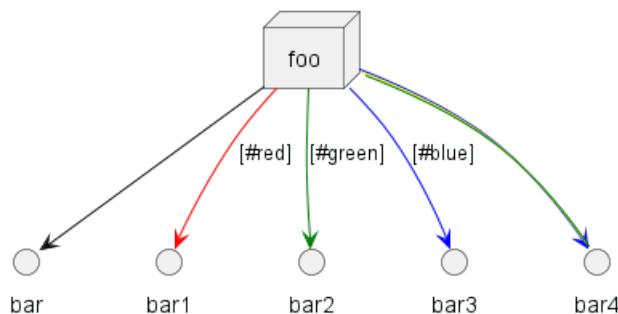


**Bracketed line style with label**

[Adapted from QA-4181]

#### 8.4.2 Line color

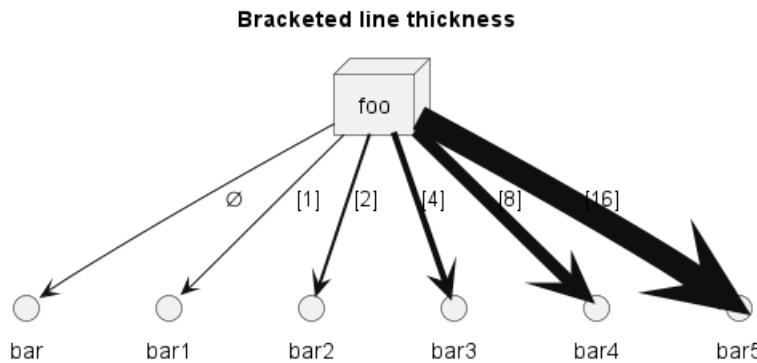
```
@startuml
title Bracketed line color
node foo
foo --> bar
foo -[#red]-> bar1      : [#red]
foo -[#green]-> bar2     : [#green]
foo -[#blue]-> bar3      : [#blue]
foo -[#blue;#yellow;#green]-> bar4
@enduml
```

**Bracketed line color**

#### 8.4.3 Line thickness

```
@startuml
title Bracketed line thickness
node foo
foo --> bar      :
foo -[thickness=1]-> bar1   : [1]
foo -[thickness=2]-> bar2   : [2]
foo -[thickness=4]-> bar3   : [4]
foo -[thickness=8]-> bar4   : [8]
foo -[thickness=16]-> bar5  : [16]
@enduml
```



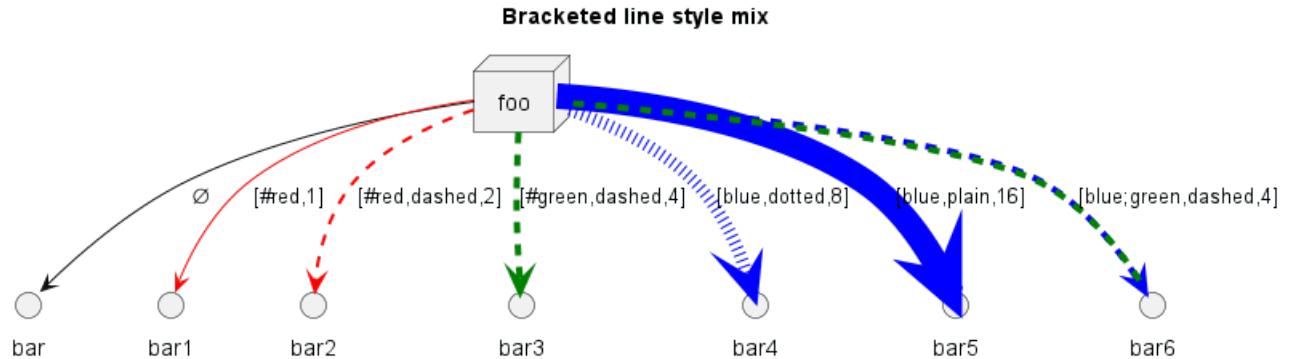


[Adapted from QA-4949]

#### 8.4.4 Mix

```

@startuml
title Bracketed line style mix
node foo
foo --> bar
foo -[#red,thickness=1]-> bar1 : [#red,1]
foo -[#red,dashed,thickness=2]-> bar2 : [#red,dashed,2]
foo -[#green,dashed,thickness=4]-> bar3 : [#green,dashed,4]
foo -[#blue,dotted,thickness=8]-> bar4 : [blue,dotted,8]
foo -[#blue,plain,thickness=16]-> bar5 : [blue,plain,16]
foo -[#blue;#green,dashed,thickness=4]-> bar6 : [blue;green,dashed,4]
@enduml
  
```



## 8.5 Change arrow color and style (inline style)

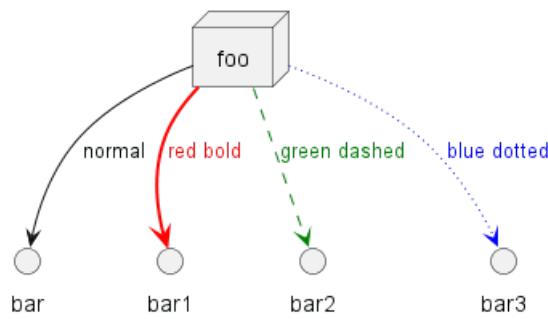
You can change the color or style of individual arrows using the inline following notation:

- `#color;line.[bold|dashed|dotted];text:color`

```

@startuml
node foo
foo --> bar : normal
foo --> bar1 #line:red;line.bold;text:red : red bold
foo --> bar2 #green;line.dashed;text:green : green dashed
foo --> bar3 #blue;line.dotted;text:blue : blue dotted
@enduml
  
```





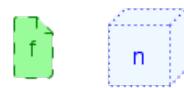
[Ref. QA-3770 and QA-3816] [See similar feature on class diagram]

## 8.6 Change element color and style (inline style)

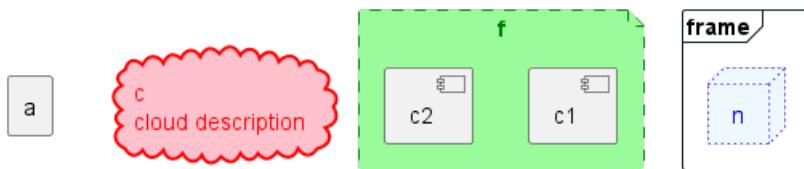
You can change the color or style of individual element using the following notation:

- # [color|back:color];line:color;line.[bold|dashed|dotted];text:color

```
@startuml
agent a
cloud c #pink;line:red;line.bold;text:red
file f #palegreen;line:green;line.dashed;text:green
node n #aliceblue;line:blue;line.dotted;text:blue
@enduml
```



```
@startuml
agent a
cloud c #pink;line:red;line.bold;text:red [
c
cloud description
]
file f #palegreen;line:green;line.dashed;text:green {
[c1]
[c2]
}
frame frame {
node n #aliceblue;line:blue;line.dotted;text:blue
}
@enduml
```



[Ref. QA-6852]



## 8.7 Nestable elements

Here are the nestable elements:

```
@startuml
artifact artifact {
}
card card {
}
cloud cloud {
}
component component {
}
database database {
}
file file {
}
folder folder {
}
frame frame {
}
hexagon hexagon {
}
node node {
}
package package {
}
queue queue {
}
rectangle rectangle {
}
stack stack {
}
storage storage {
}
@enduml
```



## 8.8 Packages and nested elements

### 8.8.1 Example with one level

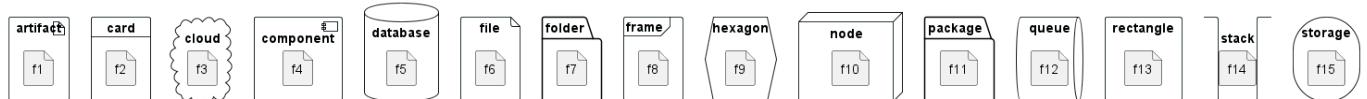
```
@startuml
artifact      artifactVeryL00000000000000000000000g      as "artifact" {
file f1
}
card         cardVeryL00000000000000000000000g      as "card" {
file f2
}
cloud        cloudVeryL00000000000000000000000g      as "cloud" {
file f3
}
component    componentVeryL00000000000000000000000g   as "component" {
file f4
}
database     databaseVeryL00000000000000000000000g    as "database" {
file f5
}
```



```

}
file      fileVeryL0000000000000000000g      as "file" {
file f6
}
folder    folderVeryL0000000000000000000g     as "folder" {
file f7
}
frame     frameVeryL0000000000000000000g     as "frame" {
file f8
}
hexagon   hexagonVeryL0000000000000000000g    as "hexagon" {
file f9
}
node      nodeVeryL0000000000000000000g      as "node" {
file f10
}
package   packageVeryL0000000000000000000g    as "package" {
file f11
}
queue     queueVeryL0000000000000000000g     as "queue" {
file f12
}
rectangle rectangleVeryL0000000000000000000g  as "rectangle" {
file f13
}
stack     stackVeryL0000000000000000000g     as "stack" {
file f14
}
storage   storageVeryL0000000000000000000g    as "storage" {
file f15
}
@enduml

```



### 8.8.2 Other example

```

@startuml
artifact Foo1 {
    folder Foo2
}

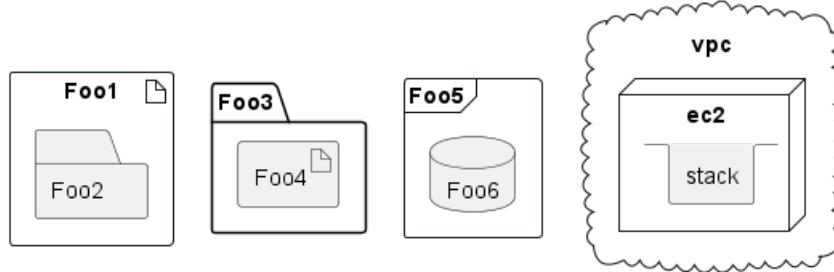
folder Foo3 {
    artifact Foo4
}

frame Foo5 {
    database Foo6
}

cloud vpc {
    node ec2 {
        stack stack
    }
}

```

```
@enduml
```

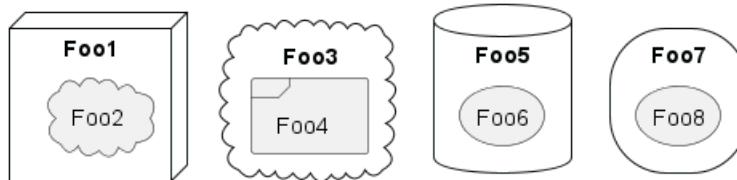


```
@startuml
node Foo1 {
    cloud Foo2
}

cloud Foo3 {
    frame Foo4
}

database Foo5 {
    storage Foo6
}

storage Foo7 {
    storage Foo8
}
}
@enduml
```



### 8.8.3 Full nesting

Here is all the nested elements:

- by alphabetical order:

```
@startuml
artifact artifact {
card card {
cloud cloud {
component component {
database database {
file file {
folder folder {
frame frame {
hexagon hexagon {
node node {
package package {
queue queue {
rectangle rectangle {
stack stack {
storage storage {
```



```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

```
}
```

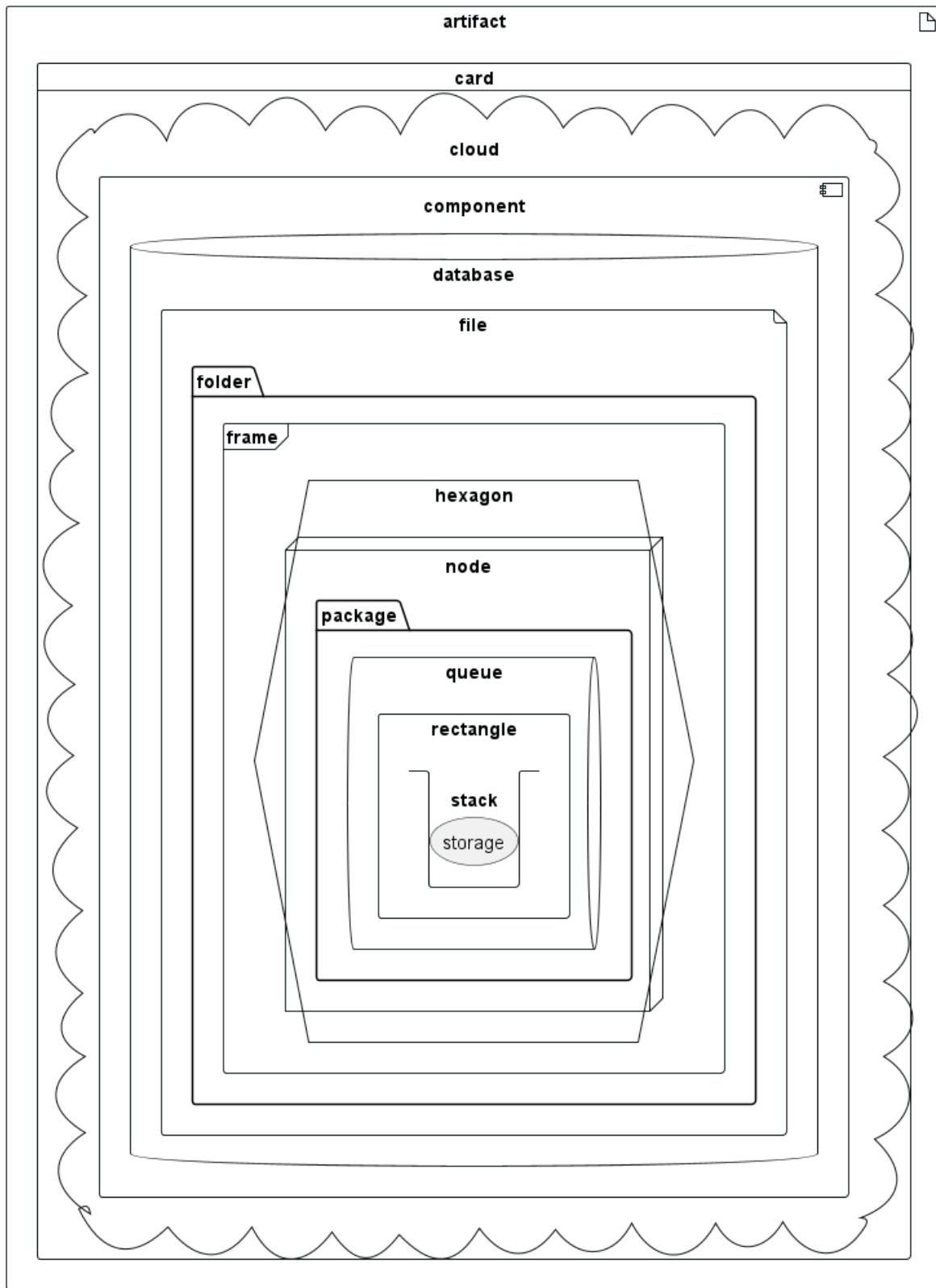
```
}
```

```
}
```

```
}
```

```
@enduml
```





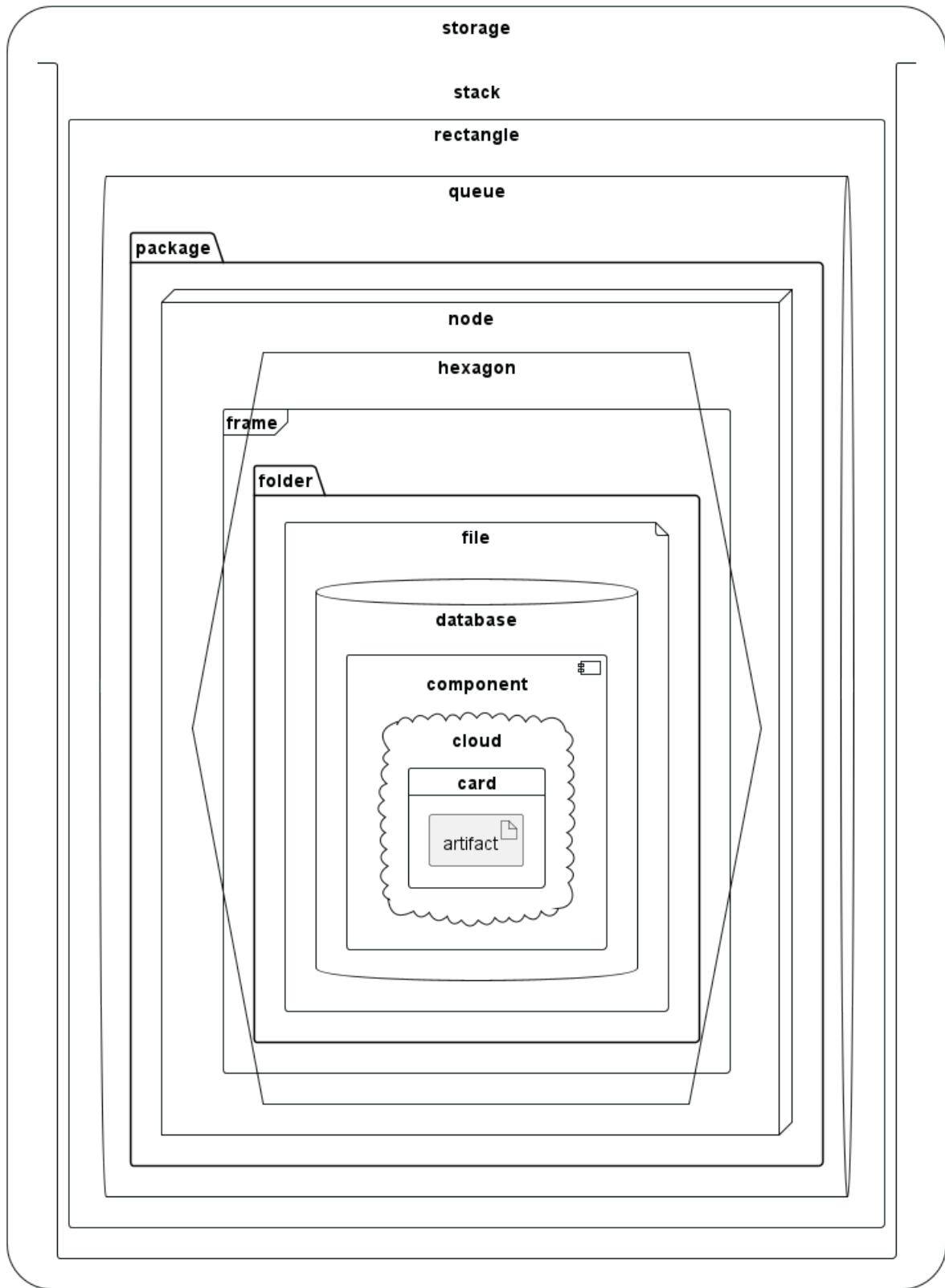
- or reverse alphabetical order

```
@startuml
storage storage {
stack stack {
rectangle rectangle {
queue queue {
package package {
```



```
node node {  
hexagon hexagon {  
frame frame {  
folder folder {  
file file {  
database database {  
component component {  
cloud cloud {  
card card {  
artifact artifact {  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}  
}@enduml
```





## 8.9 Alias

### 8.9.1 Simple alias with as

```
@startuml  
node Node1 as n1  
node "Node 2" as n2
```

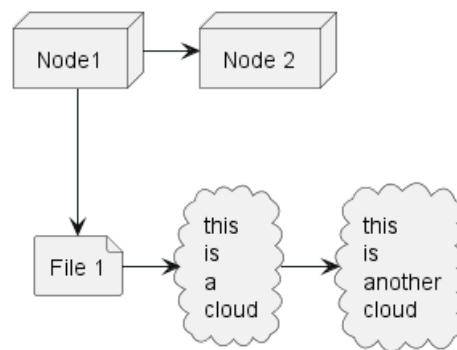


```

file f1 as "File 1"
cloud c1 as "this
is
a
cloud"
cloud c2 [this
is
another
cloud]

n1 -> n2
n1 --> f1
f1 -> c1
c1 -> c2
@enduml

```



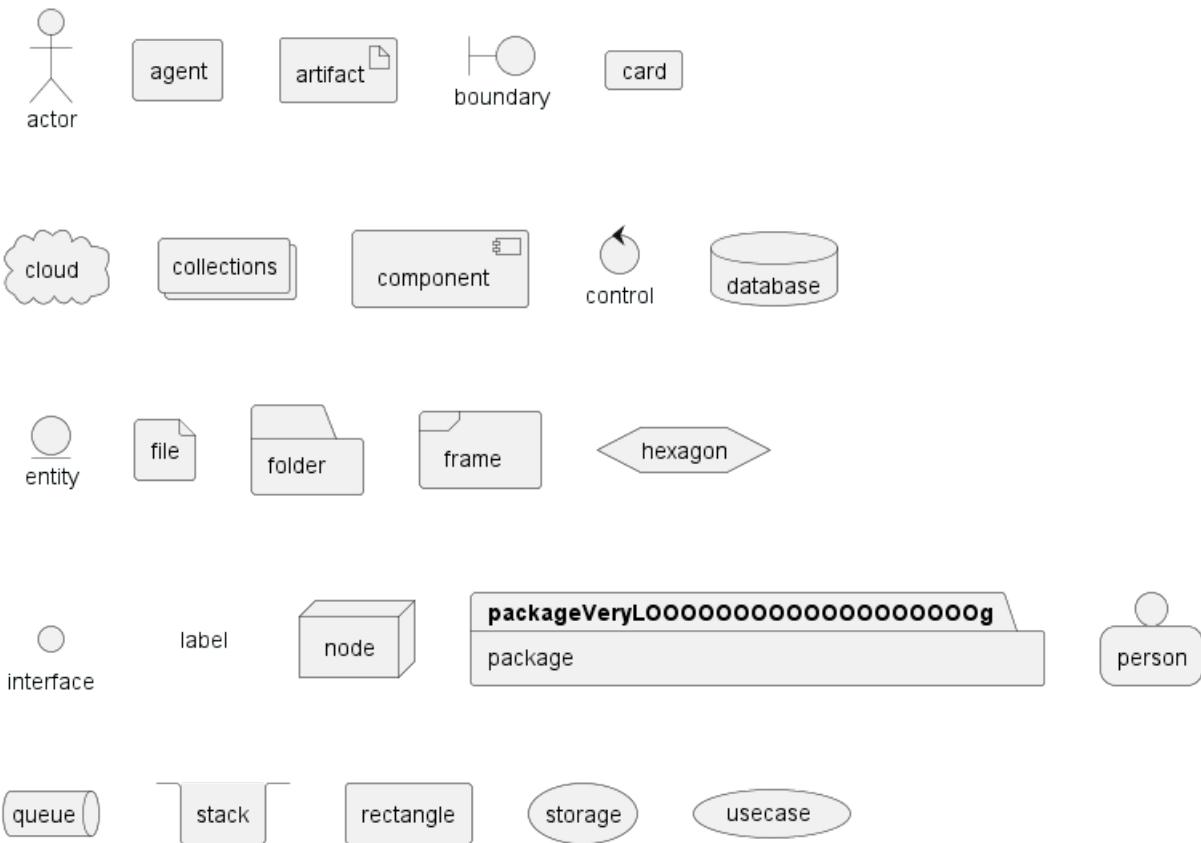
### 8.9.2 Examples of long alias

```

@startuml
actor      "actor"      as actorVeryL00000000000000000000g
agent      "agent"       as agentVeryL00000000000000000000g
artifact   "artifact"    as artifactVeryL00000000000000000000g
boundary   "boundary"   as boundaryVeryL00000000000000000000g
card       "card"        as cardVeryL00000000000000000000g
cloud      "cloud"       as cloudVeryL00000000000000000000g
collections "collections" as collectionsVeryL00000000000000000000g
component   "component"  as componentVeryL00000000000000000000g
control     "control"    as controlVeryL00000000000000000000g
database   "database"   as databaseVeryL00000000000000000000g
entity      "entity"     as entityVeryL00000000000000000000g
file        "file"        as fileVeryL00000000000000000000g
folder      "folder"     as folderVeryL00000000000000000000g
frame       "frame"      as frameVeryL00000000000000000000g
hexagon     "hexagon"    as hexagonVeryL00000000000000000000g
interface   "interface"  as interfaceVeryL00000000000000000000g
label       "label"      as labelVeryL00000000000000000000g
node        "node"        as nodeVeryL00000000000000000000g
package     "package"    as packageVeryL00000000000000000000g
person      "person"     as personVeryL00000000000000000000g
queue       "queue"      as queueVeryL00000000000000000000g
stack       "stack"      as stackVeryL00000000000000000000g
rectangle   "rectangle"  as rectangleVeryL00000000000000000000g
storage     "storage"    as storageVeryL00000000000000000000g
usecase     "usecase"   as usecaseVeryL00000000000000000000g
@enduml

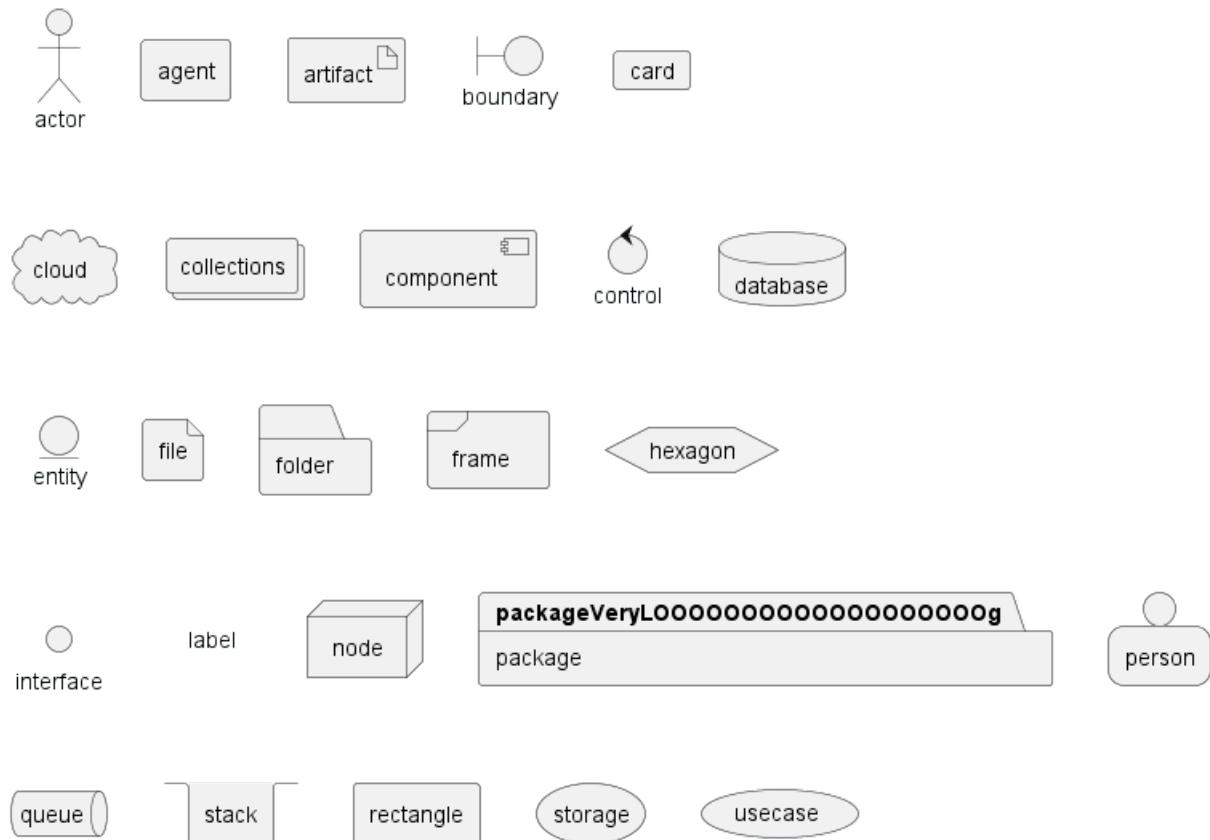
```





```
@startuml
actor      actorVeryLoooooooooooooog           as "actor"
agent      agentVeryLoooooooooooooog           as "agent"
artifact    artifactVeryLoooooooooooooog        as "artifact"
boundary   boundaryVeryLoooooooooooooog       as "boundary"
card       cardVeryLoooooooooooooog            as "card"
cloud       cloudVeryLoooooooooooooog          as "cloud"
collections collectionsVeryLoooooooooooooog   as "collections"
component   componentVeryLoooooooooooooog      as "component"
control     controlVeryLoooooooooooooog         as "control"
database   databaseVeryLoooooooooooooog        as "database"
entity      entityVeryLoooooooooooooog          as "entity"
file        fileVeryLoooooooooooooog            as "file"
folder      folderVeryLoooooooooooooog          as "folder"
frame       frameVeryLoooooooooooooog           as "frame"
hexagon    hexagonVeryLoooooooooooooog          as "hexagon"
interface   interfaceVeryLoooooooooooooog       as "interface"
label      labelVeryLoooooooooooooog            as "label"
node       nodeVeryLoooooooooooooog             as "node"
package    packageVeryLoooooooooooooog          as "package"
person     personVeryLoooooooooooooog           as "person"
queue      queueVeryLoooooooooooooog            as "queue"
stack      stackVeryLoooooooooooooog            as "stack"
rectangle  rectangleVeryLoooooooooooooog         as "rectangle"
storage    storageVeryLoooooooooooooog           as "storage"
usecase    usecaseVeryLoooooooooooooog          as "usecase"
@enduml
```



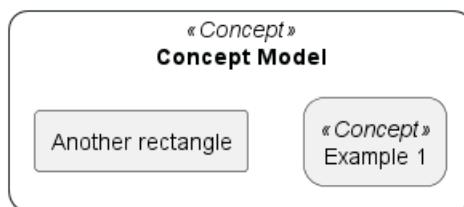


[Ref. QA-12082]

## 8.10 Round corner

```
@startuml
skinparam rectangle {
    roundCorner<<Concept>> 25
}

rectangle "Concept Model" <<Concept>> {
    rectangle "Example 1" <<Concept>> as ex1
    rectangle "Another rectangle"
}
@enduml
```



## 8.11 Specific SkinParameter

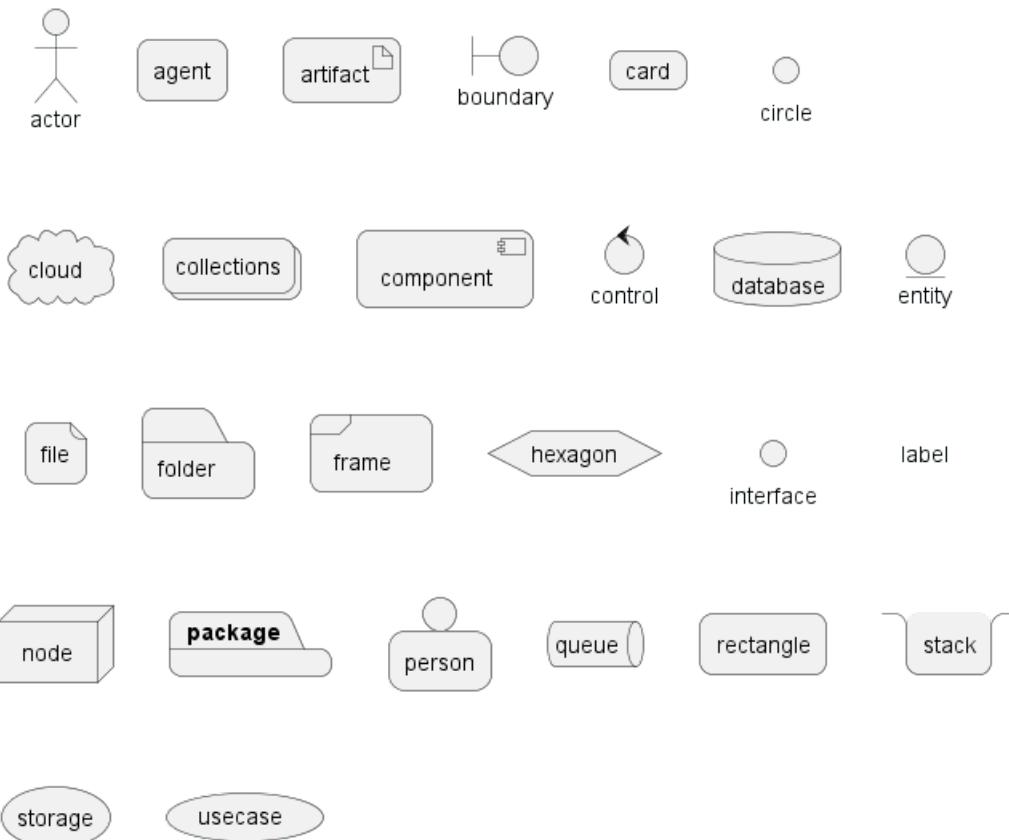
### 8.11.1 roundCorner

```
@startuml
skinparam roundCorner 15
actor actor
agent agent
artifact artifact
```

```

boundary boundary
card card
circle circle
cloud cloud
collections collections
component component
control control
database database
entity entity
file file
folder folder
frame frame
hexagon hexagon
interface interface
label label
node node
package package
person person
queue queue
rectangle rectangle
stack stack
storage storage
usecase usecase
@enduml

```



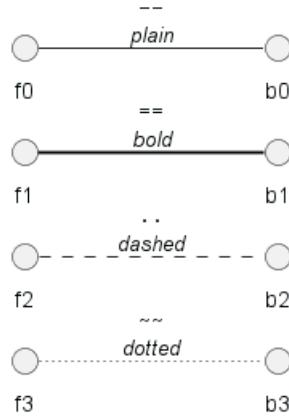
## 8.12 Appendix: All type of arrow line

```

@startuml
left to right direction
skinparam nodesep 5

```

```
f3 ~~ b3 : ""~~""\n//dotted//  
f2 .. b2 : ""..""\n//dashed//  
f1 == b1 : ""==""\n//bold//  
f0 -- b0 : ""--""\n//plain//  
@enduml
```

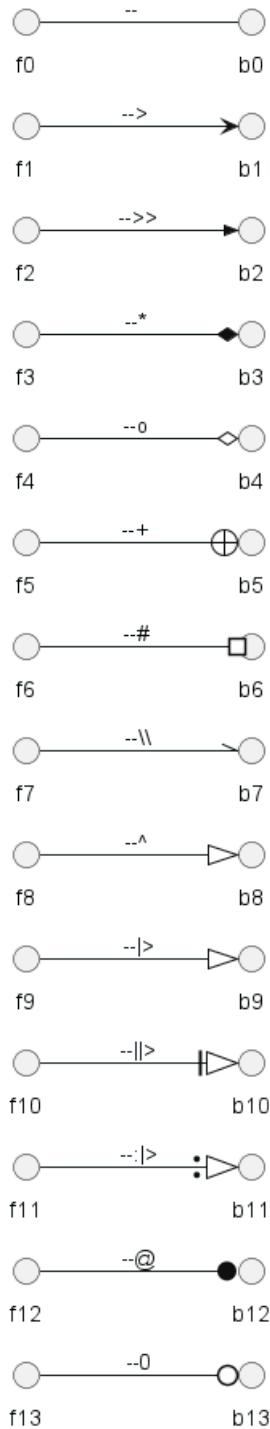


## 8.13 Appendix: All type of arrow head or '0' arrow

### 8.13.1 Type of arrow head

```
@startuml  
left to right direction  
skinparam nodesep 5  
  
f13 --0 b13 : ""--0""  
f12 --@ b12 : ""--@""  
f11 --:|> b11 : ""--:|>""  
f10 --||> b10 : ""--||>""  
f9 --|> b9 : ""--|>""  
f8 --^ b8 : ""--^""  
f7 --\\ b7 : ""--\\\""  
f6 --# b6 : ""--#""  
f5 --+ b5 : ""--+""  
f4 --o b4 : ""--o""  
f3 --* b3 : ""--*""  
f2 -->> b2 : ""-->>""  
f1 --> b1 : ""-->""  
f0 -- b0 : ""--""  
@enduml
```





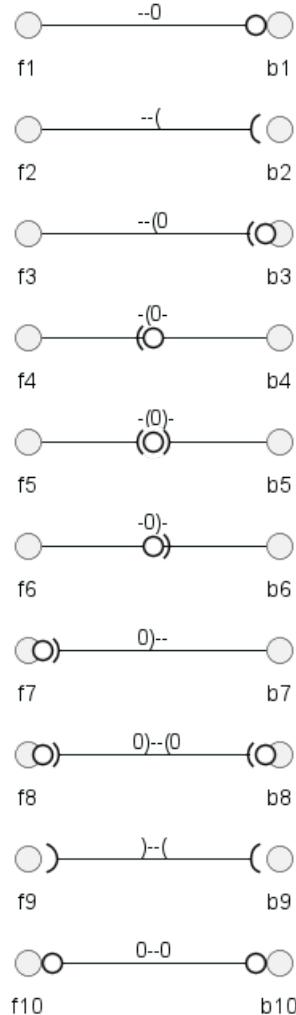
### 8.13.2 Type of '0' arrow or circle arrow

```
@startuml
left to right direction
skinparam nodesep 5

f10 0--0 b10 : "" 0--0 ""
f9 )--( b9 : "" )--( ""
f8 0)--(0 b8 : "" 0)--(0 ""
f7 0)-- b7 : "" 0)-- ""
f6 -0)- b6 : "" -0)- ""
f5 -(0)- b5 : "" -(0)-""
```



```
f4 -(0- b4 : "" -(0- ""
f3 --(0 b3 : "" --(0 ""
f2 --( b2 : "" --( "
f1 --0 b1 : "" --0 """
@enduml
```



## 8.14 Appendix: Test of inline style on all element

### 8.14.1 Simple element

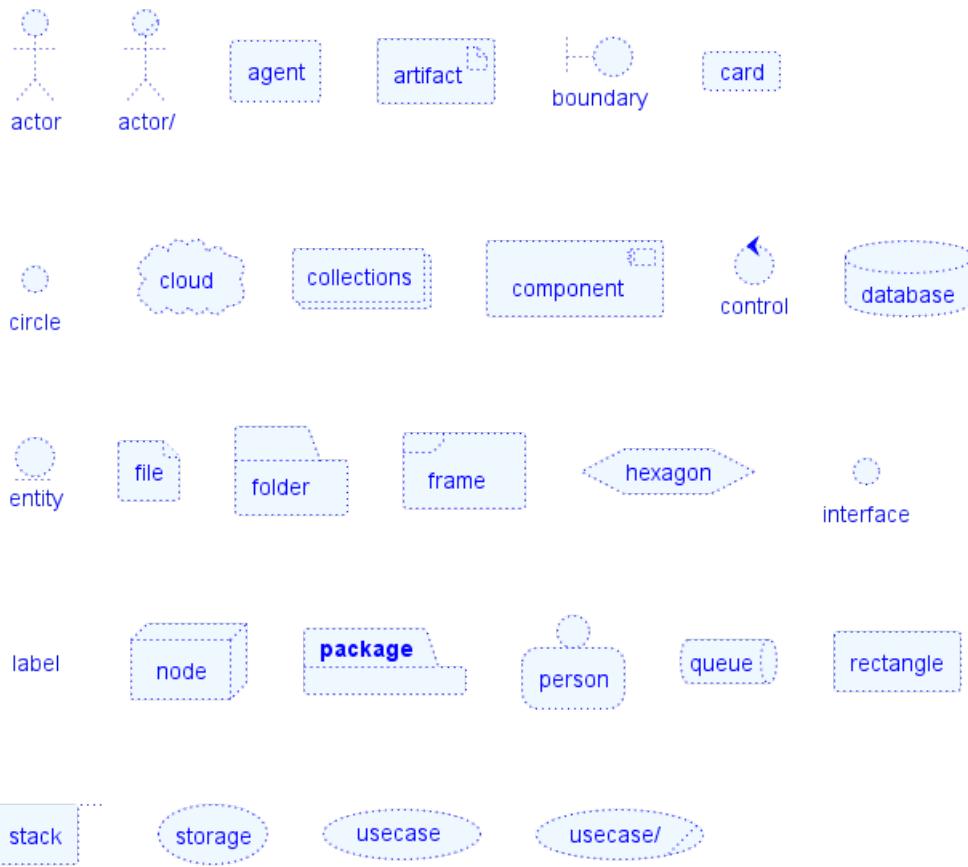
```
@startuml
actor actor          #aliceblue;line:blue;line.dotted;text:blue
actor/ "actor/"      #aliceblue;line:blue;line.dotted;text:blue
agent agent          #aliceblue;line:blue;line.dotted;text:blue
artifact artifact    #aliceblue;line:blue;line.dotted;text:blue
boundary boundary   #aliceblue;line:blue;line.dotted;text:blue
card card            #aliceblue;line:blue;line.dotted;text:blue
circle circle        #aliceblue;line:blue;line.dotted;text:blue
cloud cloud          #aliceblue;line:blue;line.dotted;text:blue
collections collections #aliceblue;line:blue;line.dotted;text:blue
component component  #aliceblue;line:blue;line.dotted;text:blue
control control      #aliceblue;line:blue;line.dotted;text:blue
database database    #aliceblue;line:blue;line.dotted;text:blue
entity entity         #aliceblue;line:blue;line.dotted;text:blue
file file            #aliceblue;line:blue;line.dotted;text:blue
folder folder         #aliceblue;line:blue;line.dotted;text:blue
```



```

frame frame          #aliceblue;line:blue;line.dotted;text:blue
hexagon hexagon      #aliceblue;line:blue;line.dotted;text:blue
interface interface  #aliceblue;line:blue;line.dotted;text:blue
label label          #aliceblue;line:blue;line.dotted;text:blue
node node            #aliceblue;line:blue;line.dotted;text:blue
package package      #aliceblue;line:blue;line.dotted;text:blue
person person        #aliceblue;line:blue;line.dotted;text:blue
queue queue          #aliceblue;line:blue;line.dotted;text:blue
rectangle rectangle  #aliceblue;line:blue;line.dotted;text:blue
stack stack          #aliceblue;line:blue;line.dotted;text:blue
storage storage      #aliceblue;line:blue;line.dotted;text:blue
usecase usecase      #aliceblue;line:blue;line.dotted;text:blue
usecase/ "usecase/" #aliceblue;line:blue;line.dotted;text:blue
@enduml

```



### 8.14.2 Nested element

### 8.14.3 Without sub-element

```

@startuml
artifact artifact #aliceblue;line:blue;line.dotted;text:blue {
}
card card #aliceblue;line:blue;line.dotted;text:blue {
}
cloud cloud #aliceblue;line:blue;line.dotted;text:blue {
}
component component #aliceblue;line:blue;line.dotted;text:blue {
}
database database #aliceblue;line:blue;line.dotted;text:blue {
}
file file #aliceblue;line:blue;line.dotted;text:blue {
}

```



```

}
folder folder #aliceblue;line:blue;line.dotted;text:blue {
}
frame frame #aliceblue;line:blue;line.dotted;text:blue {
}
hexagon hexagon #aliceblue;line:blue;line.dotted;text:blue {
}
node node #aliceblue;line:blue;line.dotted;text:blue {
}
package package #aliceblue;line:blue;line.dotted;text:blue {
}
queue queue #aliceblue;line:blue;line.dotted;text:blue {
}
rectangle rectangle #aliceblue;line:blue;line.dotted;text:blue {
}
stack stack #aliceblue;line:blue;line.dotted;text:blue {
}
storage storage #aliceblue;line:blue;line.dotted;text:blue {
}
@enduml

```



#### 8.14.4 With sub-element

```

@startuml
artifact      artifactVeryL00000000000000000000g      as "artifact" #aliceblue;line:blue;line.dotted;text:
file f1
}
card         cardVeryL00000000000000000000g      as "card" #aliceblue;line:blue;line.dotted;text:blue
file f2
}
cloud        cloudVeryL00000000000000000000g      as "cloud" #aliceblue;line:blue;line.dotted;text:blue
file f3
}
component    componentVeryL00000000000000000000g   as "component" #aliceblue;line:blue;line.dotted;text:
file f4
}
database     databaseVeryL00000000000000000000g    as "database" #aliceblue;line:blue;line.dotted;text:
file f5
}
file         fileVeryL00000000000000000000g      as "file" #aliceblue;line:blue;line.dotted;text:blue
file f6
}
folder        folderVeryL00000000000000000000g     as "folder" #aliceblue;line:blue;line.dotted;text:blue
file f7
}
frame         frameVeryL00000000000000000000g      as "frame" #aliceblue;line:blue;line.dotted;text:blue
file f8
}
hexagon       hexagonVeryL00000000000000000000g     as "hexagon" #aliceblue;line:blue;line.dotted;text:blue
file f9
}
node          nodeVeryL00000000000000000000g      as "node" #aliceblue;line:blue;line.dotted;text:blue
file f10
}
package       packageVeryL00000000000000000000g     as "package" #aliceblue;line:blue;line.dotted;text:blue

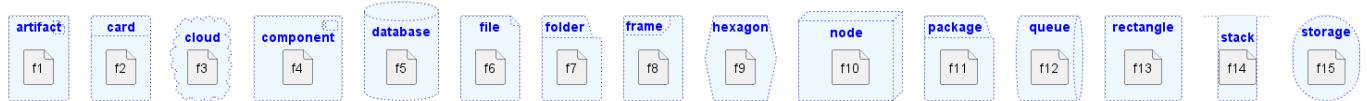
```



```

file f11
}
queue      queueVeryL0000000000000000000g      as "queue" #aliceblue;line:blue;line.dotted;text:bla
file f12
}
rectangle   rectangleVeryL0000000000000000000g   as "rectangle" #aliceblue;line:blue;line.dotted;text:bla
file f13
}
stack       stackVeryL0000000000000000000g     as "stack" #aliceblue;line:blue;line.dotted;text:bla
file f14
}
storage     storageVeryL0000000000000000000g    as "storage" #aliceblue;line:blue;line.dotted;text:bla
file f15
}
@enduml

```



## 8.15 Appendix: Test of style on all element

### 8.15.1 Simple element

### 8.15.2 Global style (on componentDiagram)

```

@startuml
<style>
componentDiagram {
    BackGroundColor palegreen
    LineThickness 1
    LineColor red
}
document {
    BackGroundColor white
}
</style>
actor actor
actor/ "actor/"
agent agent
artifact artifact
boundary boundary
card card
circle circle
cloud cloud
collections collections
component component
control control
database database
entity entity
file file
folder folder
frame frame
hexagon hexagon
interface interface
label label
node node
package package

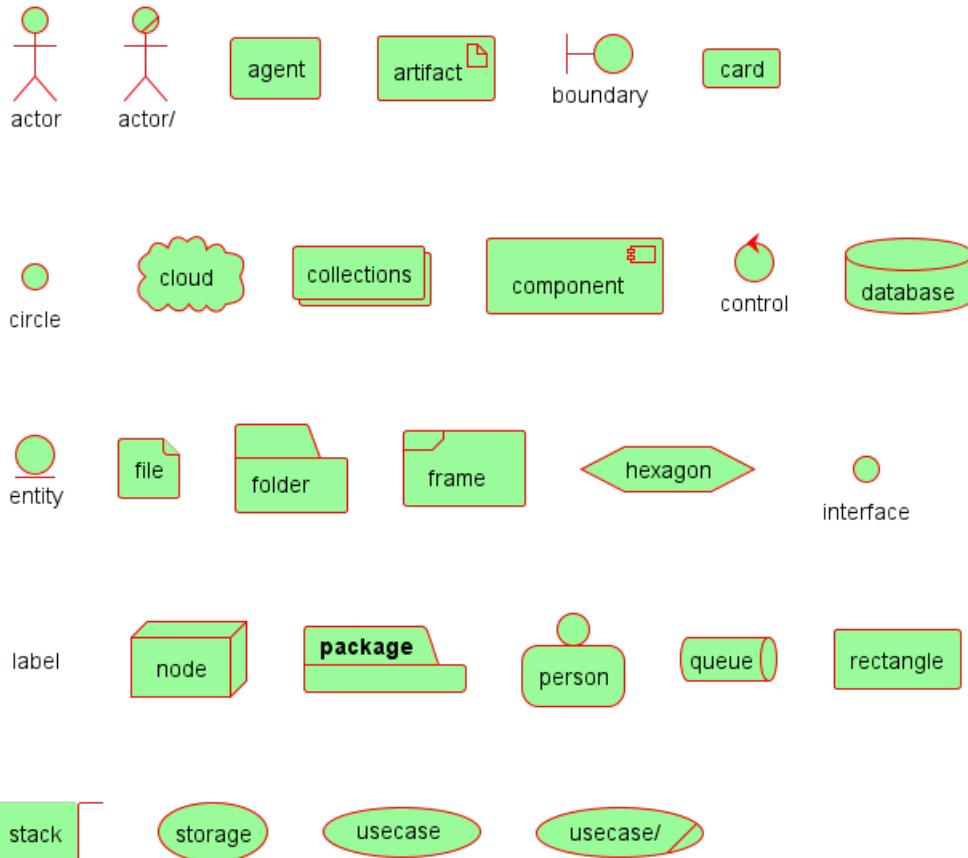
```



```

person person
queue queue
rectangle rectangle
stack stack
storage storage
usecase usecase
usecase/ "usecase/"
@enduml

```



### 8.15.3 Style for each element

```

@startuml
<style>
actor {
    BackGroundColor #f80c12
    LineThickness 1
    LineColor black
}
agent {
    BackGroundColor #f80c12
    LineThickness 1
    LineColor black
}
artifact {
    BackGroundColor #ee1100
    LineThickness 1
    LineColor black
}
boundary {
    BackGroundColor #ee1100
    LineThickness 1
}

```



```
    LineColor black
}
card {
    BackGroundColor #ff3311
    LineThickness 1
    LineColor black
}
circle {
    BackGroundColor #ff3311
    LineThickness 1
    LineColor black
}
cloud {
    BackGroundColor #ff4422
    LineThickness 1
    LineColor black
}
collections {
    BackGroundColor #ff4422
    LineThickness 1
    LineColor black
}
component {
    BackGroundColor #ff6644
    LineThickness 1
    LineColor black
}
control {
    BackGroundColor #ff6644
    LineThickness 1
    LineColor black
}
database {
    BackGroundColor #ff9933
    LineThickness 1
    LineColor black
}
entity {
    BackGroundColor #feae2d
    LineThickness 1
    LineColor black
}
file {
    BackGroundColor #feae2d
    LineThickness 1
    LineColor black
}
folder {
    BackGroundColor #ccb33
    LineThickness 1
    LineColor black
}
frame {
    BackGroundColor #d0c310
    LineThickness 1
    LineColor black
}
hexagon {
```



```

BackGroundColor #aacc22
LineThickness 1
LineColor black
}
interface {
    BackGroundColor #69d025
    LineThickness 1
    LineColor black
}
label {
    BackGroundColor black
    LineThickness 1
    LineColor black
}
node {
    BackGroundColor #22ccaa
    LineThickness 1
    LineColor black
}
package {
    BackGroundColor #12bdb9
    LineThickness 1
    LineColor black
}
person {
    BackGroundColor #11aabb
    LineThickness 1
    LineColor black
}
queue {
    BackGroundColor #11aabb
    LineThickness 1
    LineColor black
}
rectangle {
    BackGroundColor #4444dd
    LineThickness 1
    LineColor black
}
stack {
    BackGroundColor #3311bb
    LineThickness 1
    LineColor black
}
storage {
    BackGroundColor #3b0cbd
    LineThickness 1
    LineColor black
}
usecase {
    BackGroundColor #442299
    LineThickness 1
    LineColor black
}
</style>
actor actor
actor/ "actor/"
agent agent

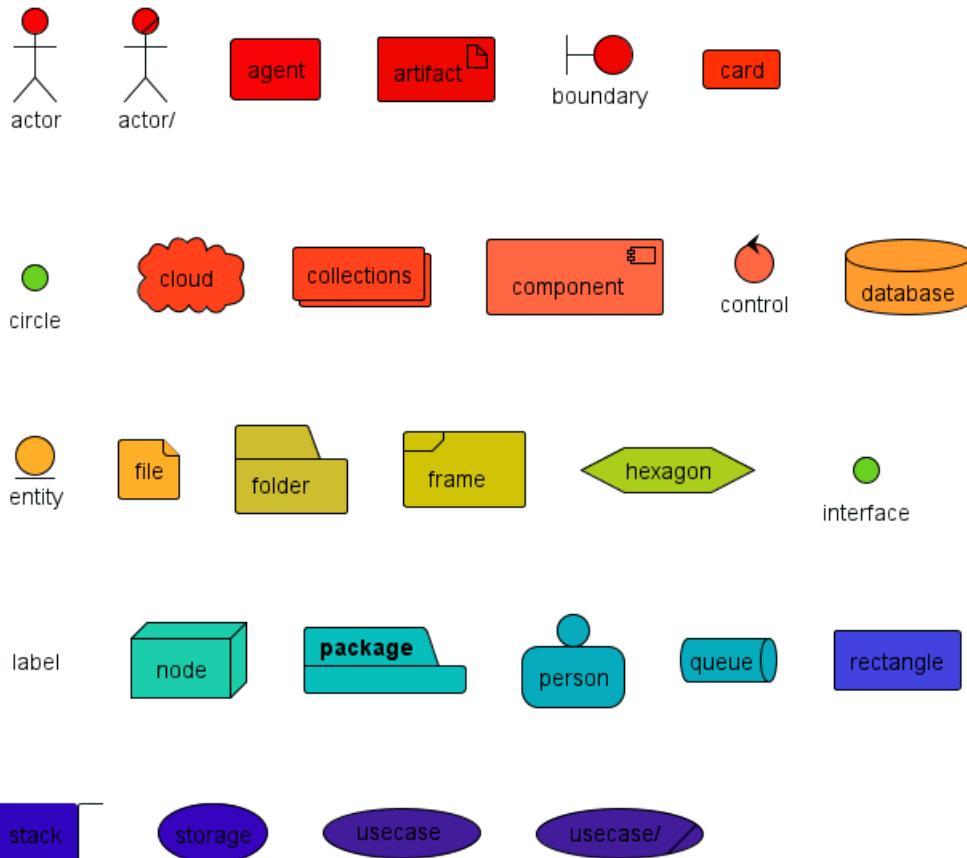
```



```

artifact artifact
boundary boundary
card card
circle circle
cloud cloud
collections collections
component component
control control
database database
entity entity
file file
folder folder
frame frame
hexagon hexagon
interface interface
label label
node node
package package
person person
queue queue
rectangle rectangle
stack stack
storage storage
usecase usecase
usecase/ "usecase/"
@enduml

```



[Ref. QA-13261]



#### 8.15.4 Nested element (without level)

#### 8.15.5 Global style (on componentDiagram)

```
@startuml
<style>
componentDiagram {
    BackGroundColor palegreen
    LineThickness 2
    LineColor red
}
</style>
artifact artifact {
}
card card {
}
cloud cloud {
}
component component {
}
database database {
}
file file {
}
folder folder {
}
frame frame {
}
hexagon hexagon {
}
node node {
}
package package {
}
queue queue {
}
rectangle rectangle {
}
stack stack {
}
storage storage {
}
@enduml
```



#### 8.15.6 Style for each nested element

```
@startuml
<style>
artifact {
    BackGroundColor #ee1100
    LineThickness 1
    LineColor black
}
card {
    BackGroundColor #ff3311
    LineThickness 1
```



```
LineColor black
}
cloud {
    BackGroundColor #ff4422
    LineThickness 1
    LineColor black
}
component {
    BackGroundColor #ff6644
    LineThickness 1
    LineColor black
}
database {
    BackGroundColor #ff9933
    LineThickness 1
    LineColor black
}
file {
    BackGroundColor #feae2d
    LineThickness 1
    LineColor black
}
folder {
    BackGroundColor #ccbb33
    LineThickness 1
    LineColor black
}
frame {
    BackGroundColor #d0c310
    LineThickness 1
    LineColor black
}
hexagon {
    BackGroundColor #aacc22
    LineThickness 1
    LineColor black
}
node {
    BackGroundColor #22ccaa
    LineThickness 1
    LineColor black
}
package {
    BackGroundColor #12bdb9
    LineThickness 1
    LineColor black
}
queue {
    BackGroundColor #11aabb
    LineThickness 1
    LineColor black
}
rectangle {
    BackGroundColor #4444dd
    LineThickness 1
    LineColor black
}
stack {
```



```

BackColor #3311bb
LineThickness 1
LineColor black
}
storage {
    BackGroundColor #3b0cbd
    LineThickness 1
    LineColor black
}

</style>
artifact artifact {
}
card card {
}
cloud cloud {
}
component component {
}
database database {
}
file file {
}
folder folder {
}
frame frame {
}
hexagon hexagon {
}
node node {
}
package package {
}
queue queue {
}
rectangle rectangle {
}
stack stack {
}
storage storage {
}
@enduml

```



### 8.15.7 Nested element (with one level)

### 8.15.8 Global style (on componentDiagram)

```

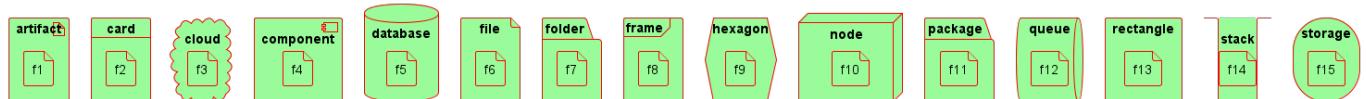
@startuml
<style>
componentDiagram {
    BackGroundColor palegreen
    LineThickness 1
    LineColor red
}
document {
    BackGroundColor white

```

```

}
</style>
artifact e1 as "artifact" {
file f1
}
card e2 as "card" {
file f2
}
cloud e3 as "cloud" {
file f3
}
component e4 as "component" {
file f4
}
database e5 as "database" {
file f5
}
file e6 as "file" {
file f6
}
folder e7 as "folder" {
file f7
}
frame e8 as "frame" {
file f8
}
hexagon e9 as "hexagon" {
file f9
}
node e10 as "node" {
file f10
}
package e11 as "package" {
file f11
}
queue e12 as "queue" {
file f12
}
rectangle e13 as "rectangle" {
file f13
}
stack e14 as "stack" {
file f14
}
storage e15 as "storage" {
file f15
}
@enduml

```



### 8.15.9 Style for each nested element

```
@startuml
<style>
```

```
artifact {
    BackGroundColor #ee1100
    LineThickness 1
    LineColor black
}
card {
    BackGroundColor #ff3311
    LineThickness 1
    LineColor black
}
cloud {
    BackGroundColor #ff4422
    LineThickness 1
    LineColor black
}
component {
    BackGroundColor #ff6644
    LineThickness 1
    LineColor black
}
database {
    BackGroundColor #ff9933
    LineThickness 1
    LineColor black
}
file {
    BackGroundColor #feae2d
    LineThickness 1
    LineColor black
}
folder {
    BackGroundColor #ccbb33
    LineThickness 1
    LineColor black
}
frame {
    BackGroundColor #d0c310
    LineThickness 1
    LineColor black
}
hexagon {
    BackGroundColor #aacc22
    LineThickness 1
    LineColor black
}
node {
    BackGroundColor #22ccaa
    LineThickness 1
    LineColor black
}
package {
    BackGroundColor #12bdb9
    LineThickness 1
    LineColor black
}
queue {
    BackGroundColor #11aabb
    LineThickness 1
```



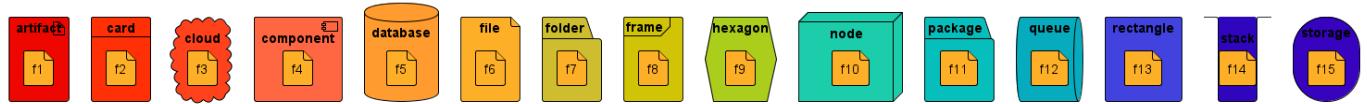
```
    LineColor black
}
rectangle {
    BackGroundColor #4444dd
    LineThickness 1
    LineColor black
}
stack {
    BackGroundColor #3311bb
    LineThickness 1
    LineColor black
}
storage {
    BackGroundColor #3b0cbd
    LineThickness 1
    LineColor black
}
</style>
artifact e1 as "artifact" {
file f1
}
card e2 as "card" {
file f2
}
cloud e3 as "cloud" {
file f3
}
component e4 as "component" {
file f4
}
database e5 as "database" {
file f5
}
file e6 as "file" {
file f6
}
folder e7 as "folder" {
file f7
}
frame e8 as "frame" {
file f8
}
hexagon e9 as "hexagon" {
file f9
}
node e10 as "node" {
file f10
}
package e11 as "package" {
file f11
}
queue e12 as "queue" {
file f12
}
rectangle e13 as "rectangle" {
file f13
}
stack e14 as "stack" {
```



```

file f14
}
storage e15 as "storage" {
file f15
}
}
@enduml

```



## 8.16 Appendix: Test of stereotype with style on all element

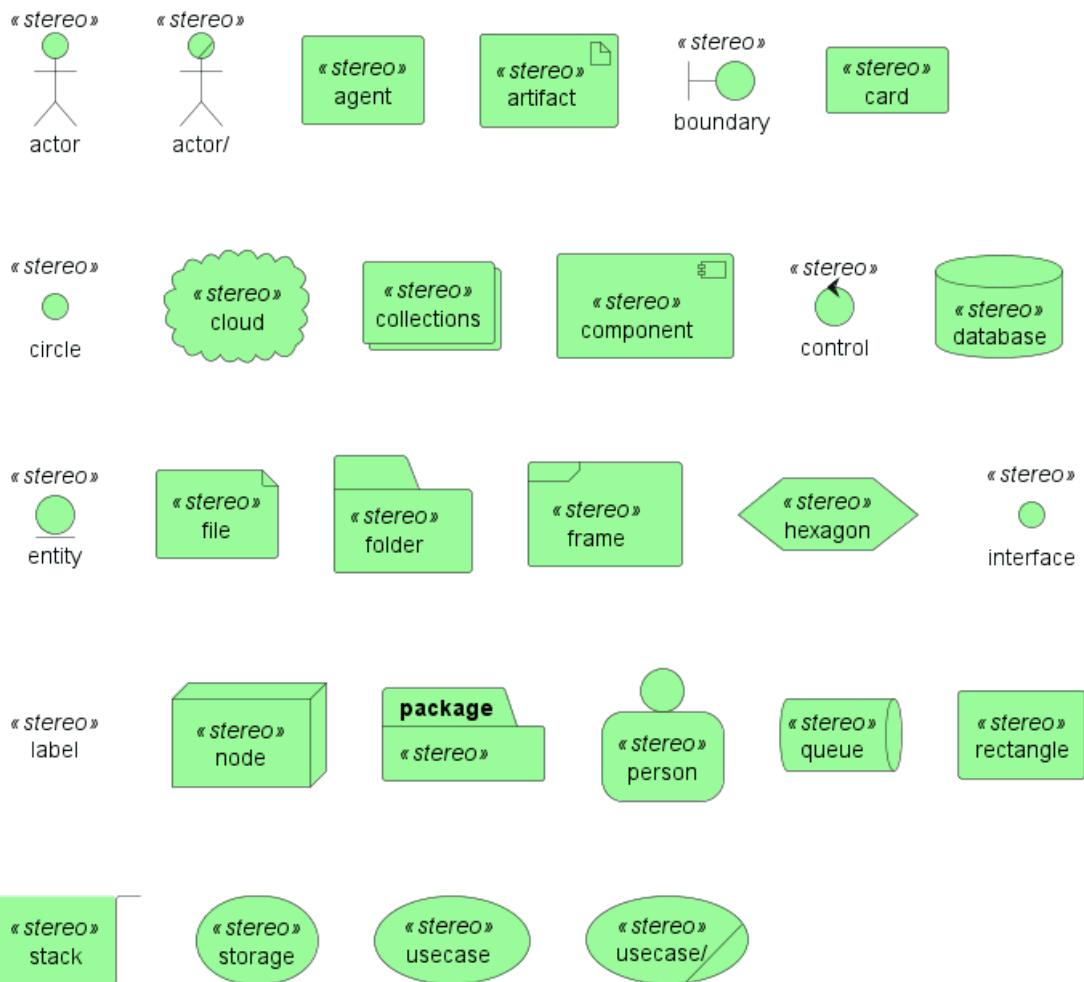
### 8.16.1 Simple element

```

@startuml
<style>
.stereo {
    BackgroundColor palegreen
}
</style>
actor actor << stereo >>
actor/ "actor/" << stereo >>
agent agent << stereo >>
artifact artifact << stereo >>
boundary boundary << stereo >>
card card << stereo >>
circle circle << stereo >>
cloud cloud << stereo >>
collections collections << stereo >>
component component << stereo >>
control control << stereo >>
database database << stereo >>
entity entity << stereo >>
file file << stereo >>
folder folder << stereo >>
frame frame << stereo >>
hexagon hexagon << stereo >>
interface interface << stereo >>
label label << stereo >>
node node << stereo >>
package package << stereo >>
person person << stereo >>
queue queue << stereo >>
rectangle rectangle << stereo >>
stack stack << stereo >>
storage storage << stereo >>
usecase usecase << stereo >>
usecase/ "usecase/" << stereo >>
}
@enduml

```





## 8.17 Display JSON Data on Deployment diagram

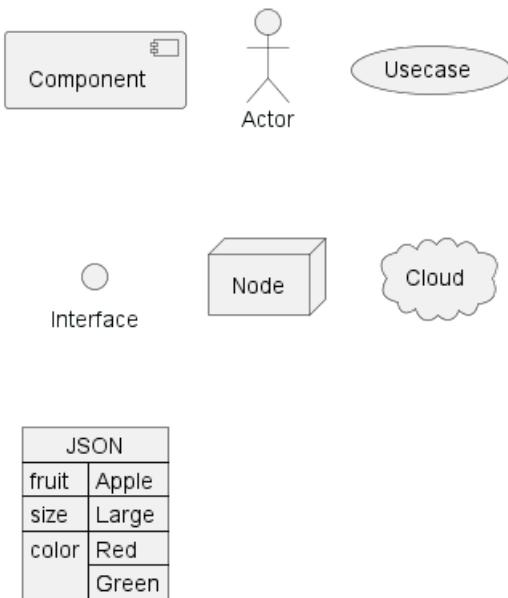
### 8.17.1 Simple example

```
@startuml
allowmixing
```

```
component Component
actor Actor
usecase Usecase
() Interface
node Node
cloud Cloud
```

```
json JSON {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml
```





[Ref. QA-15481]

For another example, see on JSON page.

## 8.18 Mixing Deployment (Usecase, Component, Deployment) element within a Class or Object diagram

In order to add a Deployment element or a State element within a Class or Object diagram, you can use the `allowmixing` or `allow_mixing` directive.

### 8.18.1 Mixing all elements

```
@startuml
```

```
allowmixing
```

```

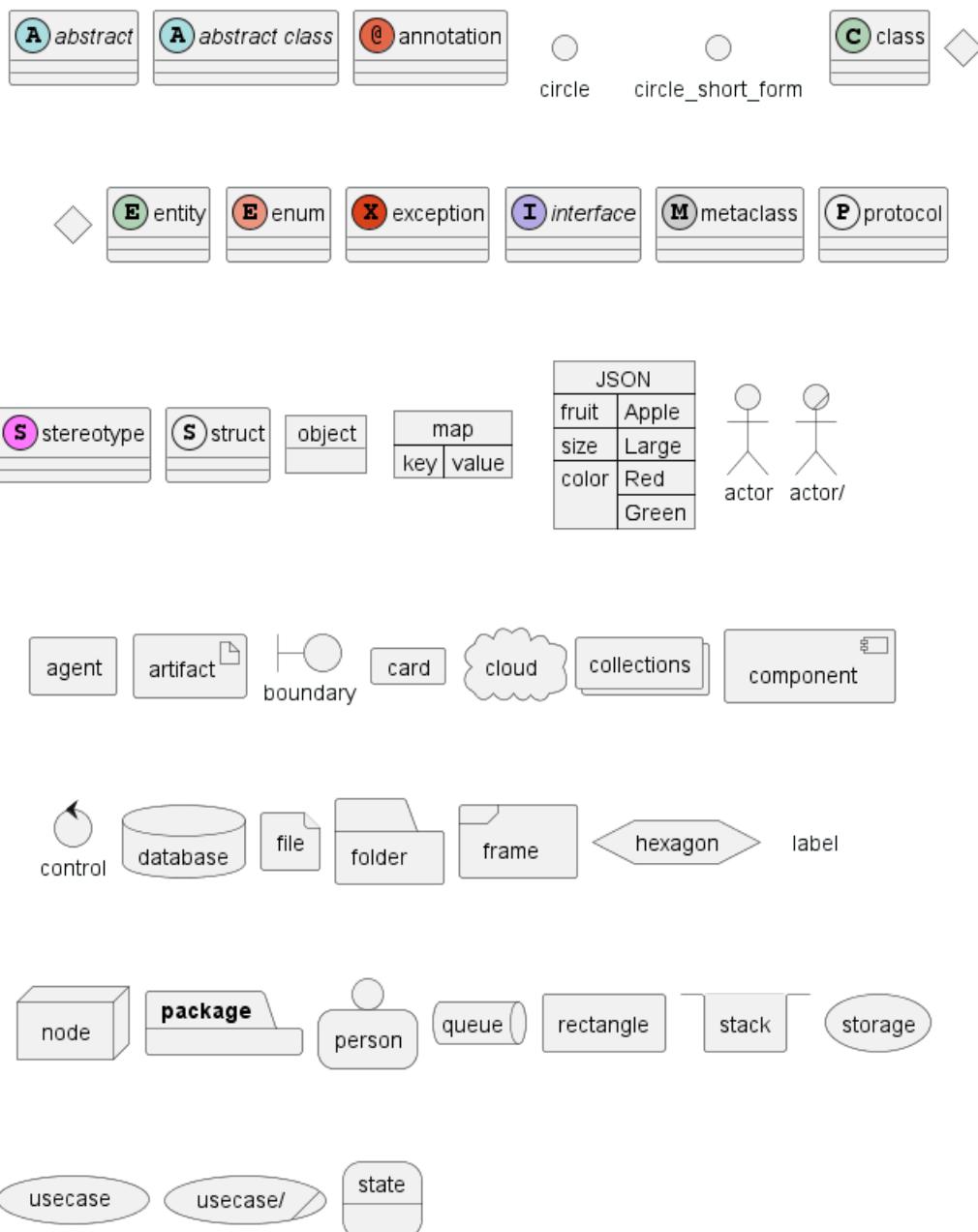
skinparam nodesep 10
abstract      abstract
abstract class "abstract class"
annotation    annotation
circle        circle
()            circle_short_form
class         class
diamond       diamond
<>           diamond_short_form
entity        entity
enum          enum
exception     exception
interface     interface
metaclass    metaclass
protocol      protocol
stereotype   stereotype
struct        struct
object        object
map map {
  key => value
}
json JSON {
  "fruit": "Apple",

```



```
"size":"Large",
"color": ["Red", "Green"]
}
actor actor
actor/ "actor/"
agent agent
artifact artifact
boundary boundary
card card
circle circle
cloud cloud
collections collections
component component
control control
database database
entity entity
file file
folder folder
frame frame
hexagon hexagon
interface interface
label label
node node
package package
person person
queue queue
rectangle rectangle
stack stack
storage storage
usecase usecase
usecase/ "usecase/"
state state
@enduml
```





[Ref. QA-2335 and QA-5329]

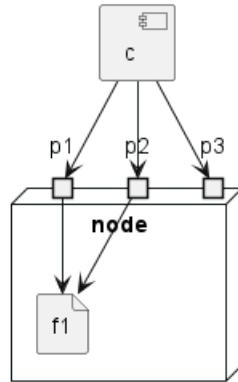
## 8.19 Port [port, portIn, portOut]

You can added **port** with **port**, **portin**and **portout** keywords.

### 8.19.1 Port

```
@startuml
[c]
node node {
    port p1
    port p2
    port p3
    file f1
}
c --> p1
```

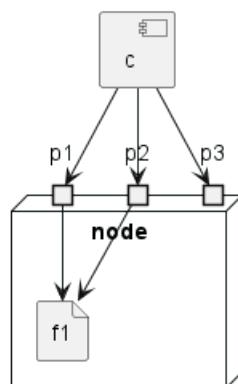
```
c --> p2
c --> p3
p1 --> f1
p2 --> f1
@enduml
```



### 8.19.2 PortIn

```
@startuml
[c]
node node {
    portin p1
    portin p2
    portin p3
    file f1
}

c --> p1
c --> p2
c --> p3
p1 --> f1
p2 --> f1
@enduml
```



### 8.19.3 PortOut

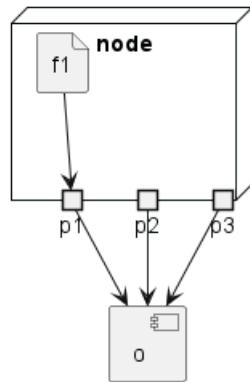
```
@startuml
node node {
    portout p1
    portout p2
    portout p3
    file f1
```



```

}
[o]
p1 --> o
p2 --> o
p3 --> o
f1 --> p1
@enduml

```



#### 8.19.4 Mixing PortIn & PortOut

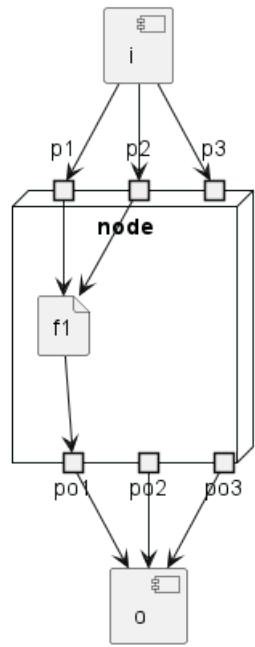
```

@startuml
[i]
node node {
    portin p1
    portin p2
    portin p3
    portout po1
    portout po2
    portout po3
    file f1
}
[o]

i --> p1
i --> p2
i --> p3
p1 --> f1
p2 --> f1
po1 --> o
po2 --> o
po3 --> o
f1 --> po1
@enduml

```





## 9 State Diagram

**State diagrams** provide a visual representation of the various states a system or an object can be in, as well as the transitions between those states. They are essential in modeling the dynamic behavior of systems, capturing how they respond to different events over time. State diagrams depict the system's life cycle, making it easier to understand, design, and optimize its behavior.

Using **PlantUML** to create state diagrams offers several advantages:

- **Text-Based Language:** Quickly define and visualize the states and transitions without the hassle of manual drawing.
- **Efficiency and Consistency:** Ensure streamlined diagram creation and easy version control.
- **Versatility:** Integrate with various documentation platforms and support multiple output formats.
- **Open-Source & Community Support:** Backed by a **strong community** that continuously contributes to its enhancements and offers invaluable resources.

### 9.1 Simple State

You can use [\*] for the starting point and ending point of the state diagram.

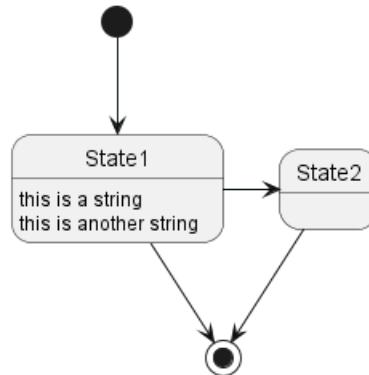
Use --> for arrows.

```
@startuml
```

```
[*] --> State1
State1 --> [*]
State1 : this is a string
State1 : this is another string

State1 -> State2
State2 --> [*]
```

```
@enduml
```



### 9.2 Change state rendering

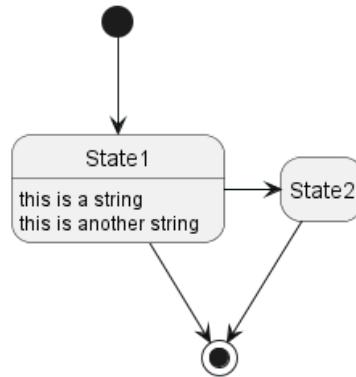
You can use `hide empty description` to render state as simple box.

```
@startuml
hide empty description
[*] --> State1
State1 --> [*]
State1 : this is a string
State1 : this is another string

State1 -> State2
State2 --> [*]
```



@enduml



## 9.3 Composite state

A state can also be composite. You have to define it using the `state` keywords and brackets.

### 9.3.1 Internal sub-state

```

@startuml
scale 350 width
[*] --> NotShooting

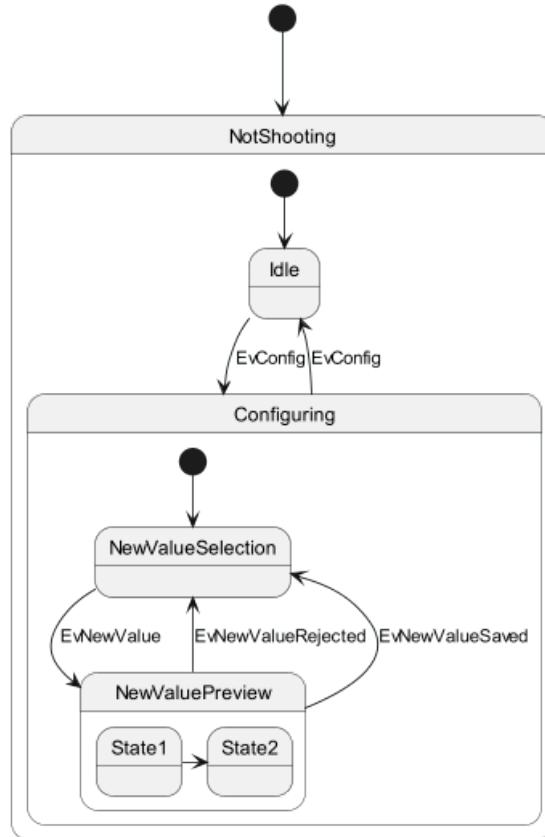
state NotShooting {
    [*] --> Idle
    Idle --> Configuring : EvConfig
    Configuring --> Idle : EvConfig
}

state Configuring {
    [*] --> NewValueSelection
    NewValueSelection --> NewValuePreview : EvnewValue
    NewValuePreview --> NewValueSelection : EvnewValueRejected
    NewValuePreview --> NewValueSelection : EvnewValueSaved

    state NewValuePreview {
        State1 -> State2
    }
}

}
@enduml
  
```

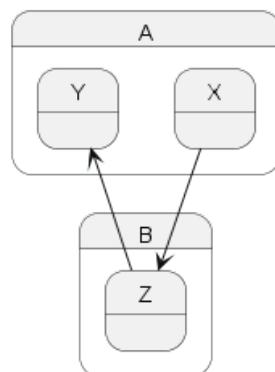




### 9.3.2 Sub-state to sub-state

```

@startuml
state A {
    state X {
        }
    state Y {
        }
}
state B {
    state Z {
        }
}
X --> Z
Z --> Y
@enduml
  
```



[Ref. QA-3300]

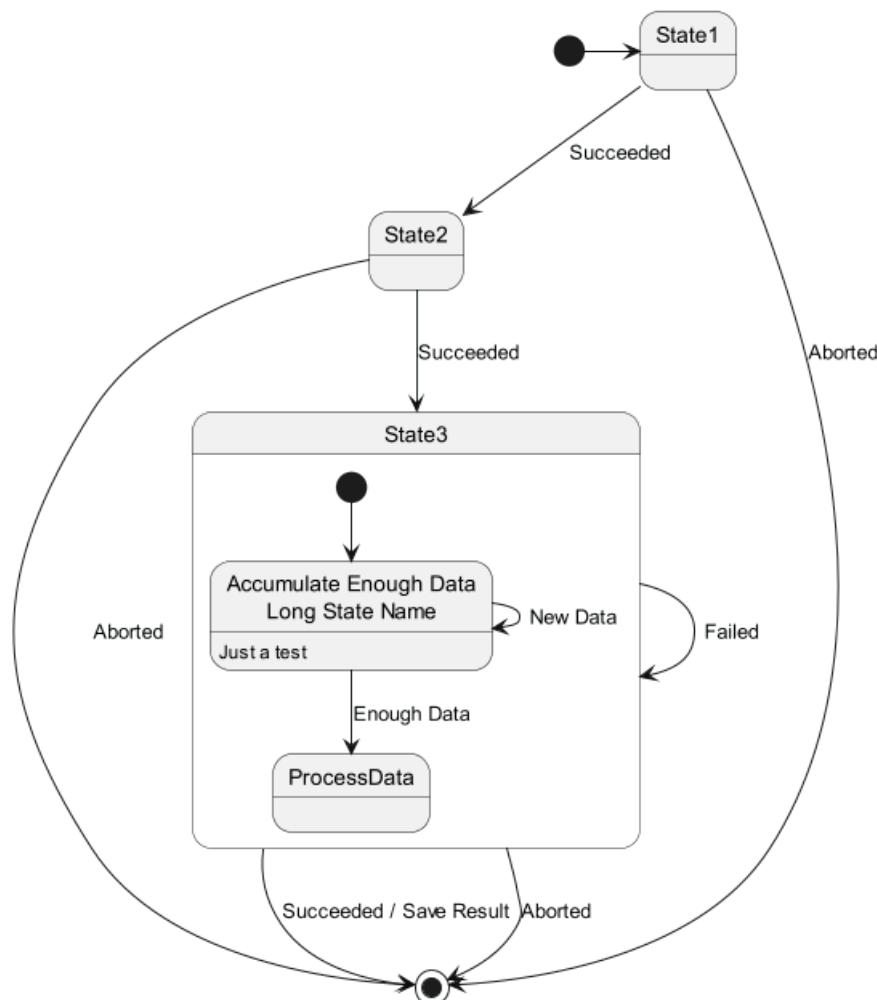
## 9.4 Long name

You can also use the `state` keyword to use long description for states.

```
@startuml
scale 600 width
```

```
[*] --> State1
State1 --> State2 : Succeeded
State1 --> [*] : Aborted
State2 --> State3 : Succeeded
State2 --> [*] : Aborted
state State3 {
    state "Accumulate Enough Data\nLong State Name" as long1
    long1 : Just a test
    [*] --> long1
    long1 --> long1 : New Data
    long1 --> ProcessData : Enough Data
}
State3 --> State3 : Failed
State3 --> [*] : Succeeded / Save Result
State3 --> [*] : Aborted
```

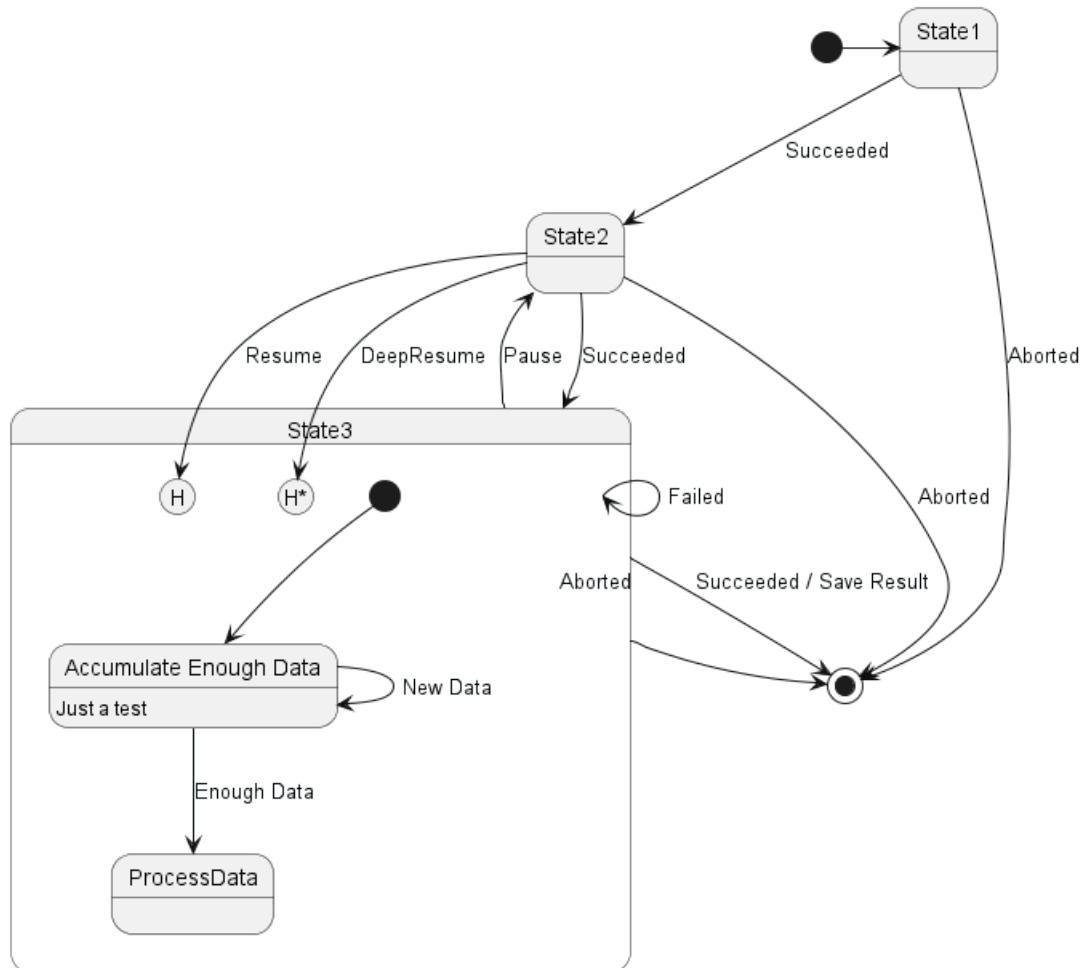
```
@enduml
```



## 9.5 History [[H], [H\*]]

You can use [H] for the history and [H\*] for the deep history of a substate.

```
@startuml
[*] --> State1
State1 --> State2 : Succeeded
State1 --> [*] : Aborted
State2 --> State3 : Succeeded
State2 --> [*] : Aborted
state State3 {
    state "Accumulate Enough Data" as long1
    long1 : Just a test
    [*] --> long1
    long1 --> long1 : New Data
    long1 --> ProcessData : Enough Data
    State2 --> [H] : Resume
}
State3 --> State2 : Pause
State2 --> State3[H*]: DeepResume
State3 --> State3 : Failed
State3 --> [*] : Succeeded / Save Result
State3 --> [*] : Aborted
@enduml
```



## 9.6 Fork [fork, join]

You can also fork and join using the <<fork>> and <<join>> stereotypes.



@startuml

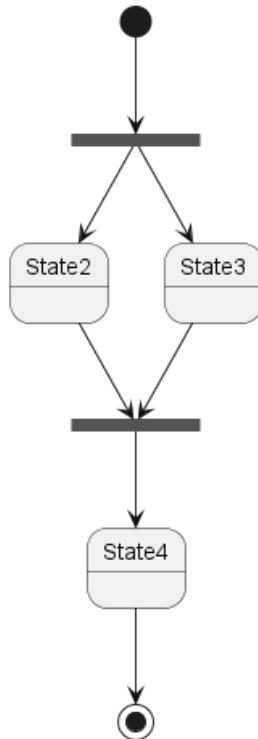
```

state fork_state <<fork>>
[*] --> fork_state
fork_state --> State2
fork_state --> State3

state join_state <<join>>
State2 --> join_state
State3 --> join_state
join_state --> State4
State4 --> [*]

```

@enduml



## 9.7 Concurrent state [-, ||]

You can define concurrent state into a composite state using either -- or || symbol as separator.

### 9.7.1 Horizontal separator --

```
@startuml
[*] --> Active
```

```

state Active {
    [*] -> NumLockOff
    NumLockOff --> NumLockOn : EvNumLockPressed
    NumLockOn --> NumLockOff : EvNumLockPressed
    --
    [*] -> CapsLockOff
    CapsLockOff --> CapsLockOn : EvCapsLockPressed
    CapsLockOn --> CapsLockOff : EvCapsLockPressed
    --
    [*] -> ScrollLockOff
    ScrollLockOff --> ScrollLockOn : EvScrollLockPressed
}

```

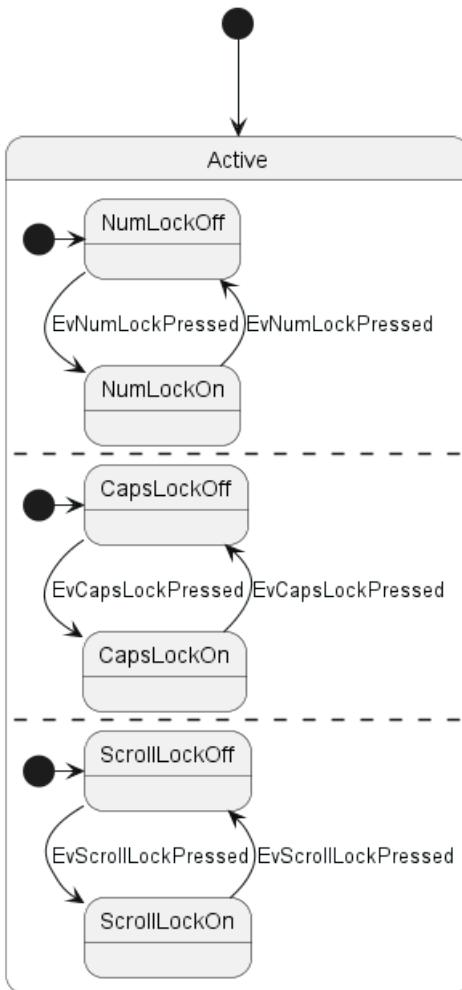


```

    ScrollLockOn --> ScrollLockOff : EvScrollLockPressed
}

@enduml

```



### 9.7.2 Vertical separator ||

```

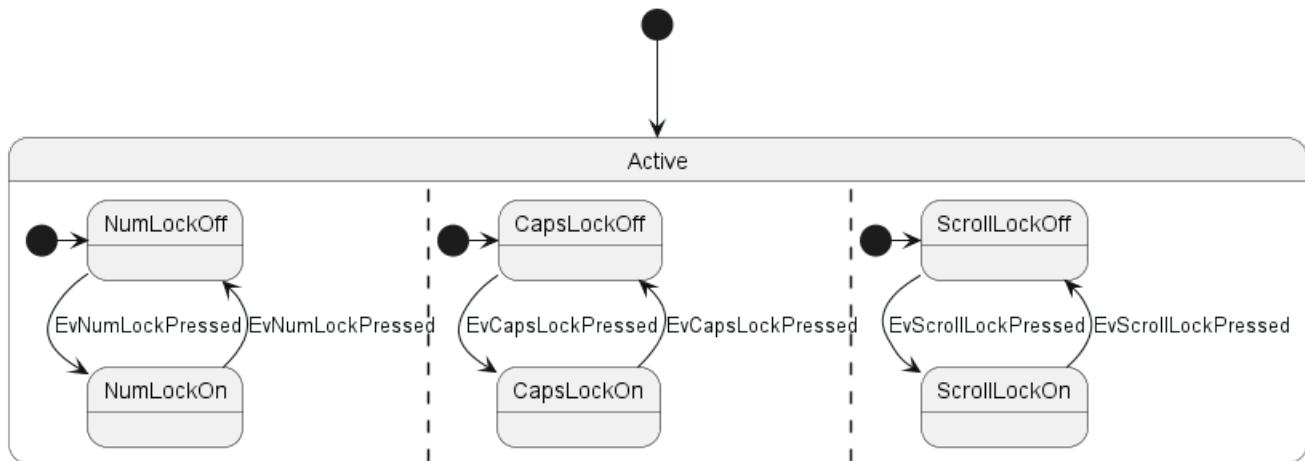
@startuml
[*] --> Active

state Active {
    [*] -> NumLockOff
    NumLockOff --> NumLockOn : EvNumLockPressed
    NumLockOn --> NumLockOff : EvNumLockPressed
    ||
    [*] -> CapsLockOff
    CapsLockOff --> CapsLockOn : EvCapsLockPressed
    CapsLockOn --> CapsLockOff : EvCapsLockPressed
    ||
    [*] -> ScrollLockOff
    ScrollLockOff --> ScrollLockOn : EvScrollLockPressed
    ScrollLockOn --> ScrollLockOff : EvScrollLockPressed
}

@enduml

```





[Ref. QA-3086]

## 9.8 Conditional [choice]

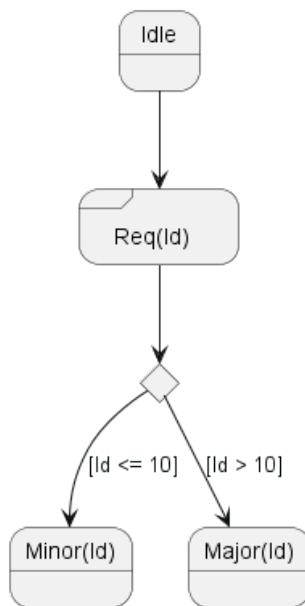
The stereotype <<choice>> can be used to use conditional state.

```

@startuml
state "Req(Id)" as ReqId <<sdlreceive>>
state "Minor(Id)" as MinorId
state "Major(Id)" as MajorId

state c <<choice>>

Idle --> ReqId
ReqId --> c
c --> MinorId : [Id <= 10]
c --> MajorId : [Id > 10]
@enduml
  
```



## 9.9 Stereotypes full example [start, choice, fork, join, end]

```

@startuml
state start1 <<start>>
state choice1 <<choice>>
  
```



```

state fork1    <<fork>>
state join2    <<join>>
state end3     <<end>>

[*]      --> choice1 : from start\nto choice
start1   --> choice1 : from start stereo\nto choice

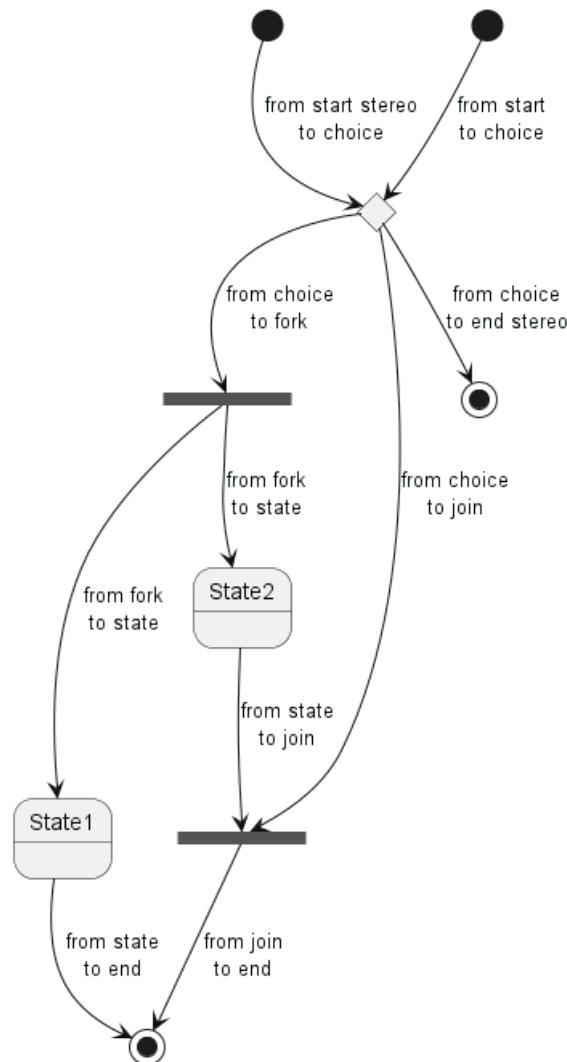
choice1 --> fork1    : from choice\nto fork
choice1 --> join2    : from choice\nto join
choice1 --> end3     : from choice\nto end stereo

fork1    ---> State1 : from fork\nto state
fork1    ---> State2 : from fork\nto state

State2   --> join2    : from state\nto join
State1   --> [*]       : from state\nto end

join2   --> [*]       : from join\nto end
@enduml

```



[Ref. QA-404, QA-1159 and GH-887]

## 9.10 Point [entryPoint, exitPoint]

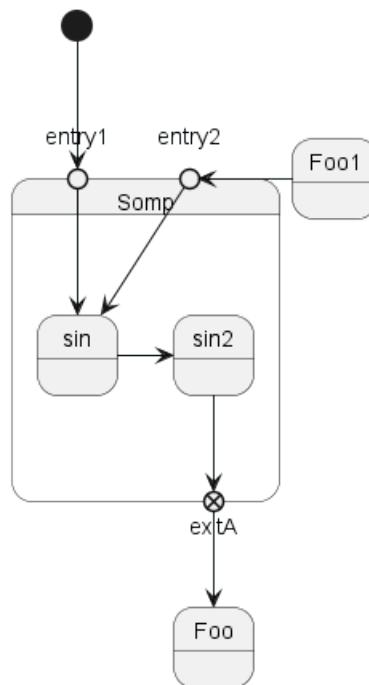
You can add **point** with `<<entryPoint>>` and `<<exitPoint>>` stereotypes:



```

@startuml
state Somp {
    state entry1 <<entryPoint>>
    state entry2 <<entryPoint>>
    state sin
    entry1 --> sin
    entry2 -> sin
    sin -> sin2
    sin2 --> exitA <<exitPoint>>
}
[*] --> entry1
exitA --> Foo
Foo1 -> entry2
@enduml

```



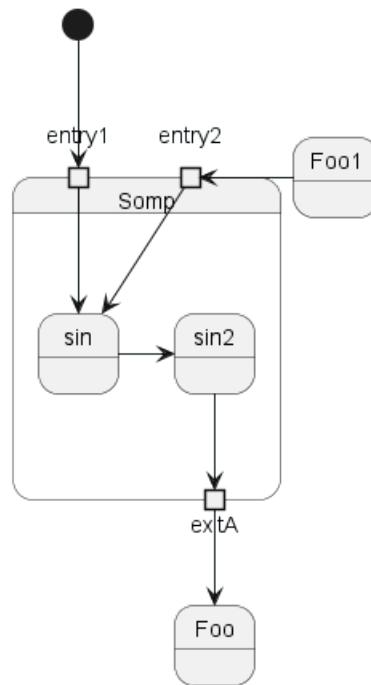
## 9.11 Pin [inputPin, outputPin]

You can add **pin** with `<<inputPin>>` and `<<outputPin>>` stereotypes:

```

@startuml
state Somp {
    state entry1 <<inputPin>>
    state entry2 <<inputPin>>
    state sin
    entry1 --> sin
    entry2 -> sin
    sin -> sin2
    sin2 --> exitA <<outputPin>>
}
[*] --> entry1
exitA --> Foo
Foo1 -> entry2
@enduml

```



[Ref. QA-4309]

## 9.12 Expansion [expansionInput, expansionOutput]

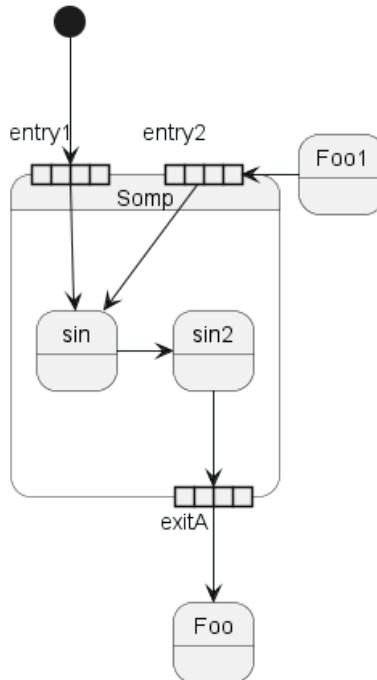
You can add **expansion** with `<<expansionInput>>` and `<<expansionOutput>>` stereotypes:

```

@startuml
state Somp {
    state entry1 <<expansionInput>>
    state entry2 <<expansionInput>>
    state sin
    entry1 --> sin
    entry2 -> sin
    sin -> sin2
    sin2 --> exitA <<expansionOutput>>
}

[*] --> entry1
exitA --> Foo
Foo1 -> entry2
@enduml
  
```





[Ref. QA-4309]

### 9.13 Arrow direction

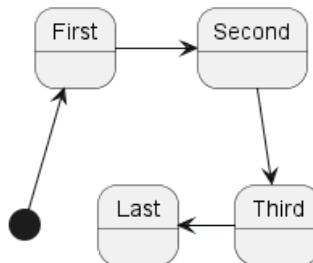
You can use `->` for horizontal arrows. It is possible to force arrow's direction using the following syntax:

- `-down->` or `-->`
- `-right->` or `->` (*default arrow*)
- `-left->`
- `-up->`

`@startuml`

```
[*] -up-> First
First -right-> Second
Second --> Third
Third -left-> Last
```

`@enduml`



You can shorten the arrow definition by using only the first character of the direction (for example, `-d-` instead of `-down-`) or the two first characters (`-do-`).

Please note that you should not abuse this functionality : *Graphviz* gives usually good results without tweaking.

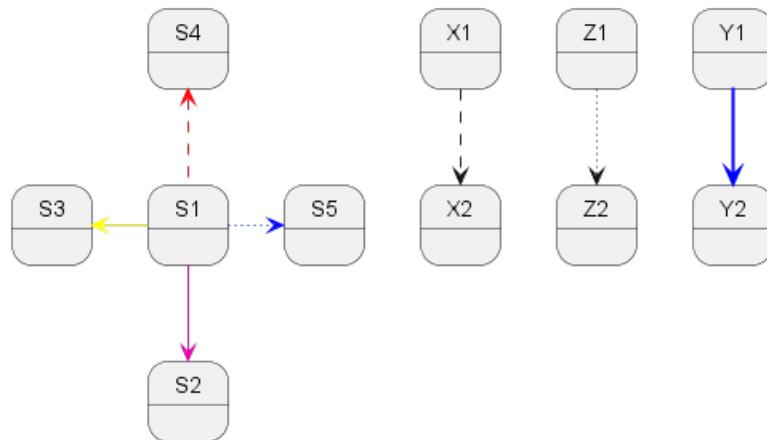


## 9.14 Change line color and style

You can change line color and/or line style.

```
@startuml
State S1
State S2
State S3
S1 -[#DD00AA]-> S2
S1 -left[#yellow]-> S3
S1 -up[#red,dashed]-> S4
S1 -right[dotted,#blue]-> S5
```

```
X1 -[dashed]-> X2
Z1 -[dotted]-> Z2
Y1 -[#blue,bold]-> Y2
@enduml
```



[Ref. Incubation: Change line color in state diagrams]

## 9.15 Note

You can also define notes using `note left of`, `note right of`, `note top of`, `note bottom of` keywords.

You can also define notes on several lines.

```
@startuml

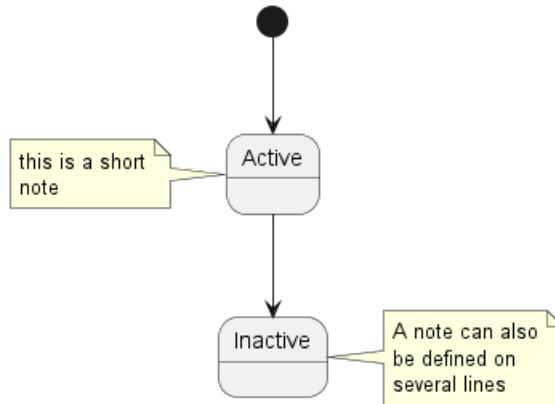
[*] --> Active
Active --> Inactive

note left of Active : this is a short\nnote

note right of Inactive
  A note can also
  be defined on
  several lines
end note

@enduml
```





You can also have floating notes.

@startuml

```

state foo
note "This is a floating note" as N1
  
```

@enduml

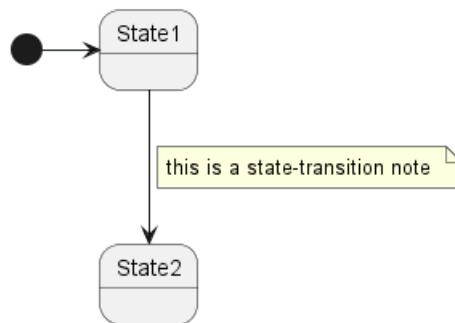


## 9.16 Note on link

You can put notes on state-transition or link, with `note on link` keyword.

```

@startuml
[*] --> State1
State1 --> State2
note on link
    this is a state-transition note
end note
@enduml
  
```



## 9.17 More in notes

You can put notes on composite states.

@startuml

```

[*] --> NotShooting

state "Not Shooting State" as NotShooting {
    state "Idle mode" as Idle
    state "Configuring mode" as Configuring
  
```



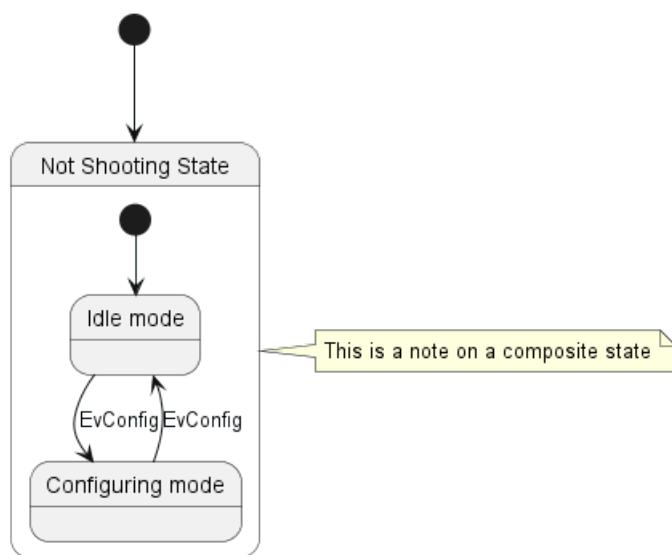
```

[*] --> Idle
Idle --> Configuring : EvConfig
Configuring --> Idle : EvConfig
}

note right of NotShooting : This is a note on a composite state

@enduml

```



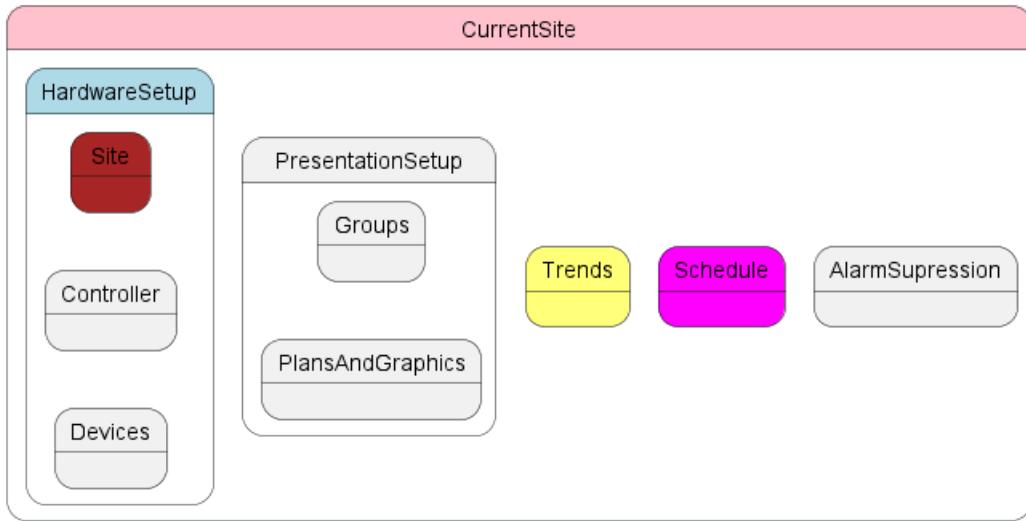
## 9.18 Inline color

```

@startuml
state CurrentSite #pink {
    state HardwareSetup #lightblue {
        state Site #brown
        Site -[hidden]-> Controller
        Controller -[hidden]-> Devices
    }
    state PresentationSetup{
        Groups -[hidden]-> PlansAndGraphics
    }
    state Trends #FFFF77
    state Schedule #magenta
    state AlarmSupression
}
@enduml

```





[Ref. QA-1812]

## 9.19 Skinparam

You can use the skinparam command to change colors and fonts for the drawing.

You can use this command :

- In the diagram definition, like any other commands,
- In an included file,
- In a configuration file, provided in the command line or the Ant task.

You can define specific color and fonts for stereotyped states.

```

@startuml
skinparam backgroundColor LightYellow
skinparam state {
    StartColor MediumBlue
    EndColor Red
    BackgroundColor Peru
    BackgroundColor<<Warning>> Olive
    BorderColor Gray
    FontName Impact
}

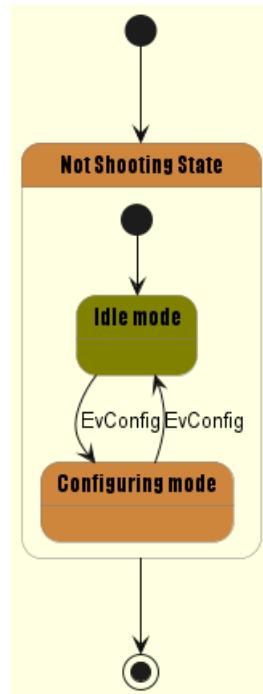
[*] --> NotShooting

state "Not Shooting State" as NotShooting {
    state "Idle mode" as Idle <<Warning>>
    state "Configuring mode" as Configuring
    [*] --> Idle
    Idle --> Configuring : EvConfig
    Configuring --> Idle : EvConfig
}

NotShooting --> [*]
@enduml

```





### 9.19.1 Test of all specific skinparam to State Diagrams

```

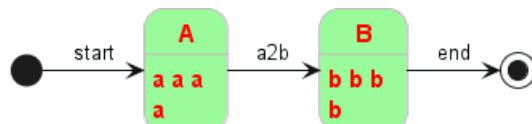
@startuml
skinparam State {
    AttributeFontColor blue
    AttributeFontName serif
    AttributeFontSize 9
    AttributeFontStyle italic
    BackgroundColor palegreen
    BorderColor violet
    EndColor gold
    FontColor red
    FontName Sanserif
    FontSize 15
    FontStyle bold
    StartColor silver
}
  
```

```

state A : a a a\na
state B : b b b\nb
  
```

```

[*] -> A : start
A -> B : a2b
B -> [*] : end
@enduml
  
```



## 9.20 Changing style

You can change style.

```
@startuml
```



```

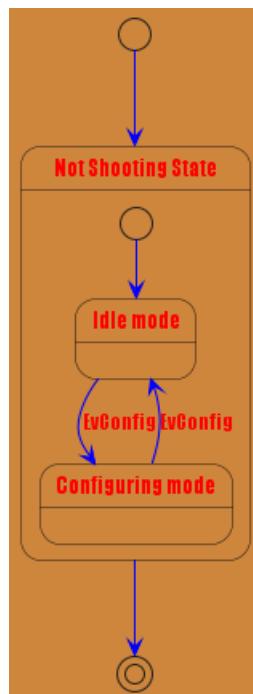
<style>
stateDiagram {
    backgroundColor Peru
    'LineColor Gray
    FontName Impact
    FontColor Red
    arrow {
        FontSize 13
        LineColor Blue
    }
}
</style>

[*] --> NotShooting

state "Not Shooting State" as NotShooting {
    state "Idle mode" as Idle <<Warning>>
    state "Configuring mode" as Configuring
    [*] --> Idle
    Idle --> Configuring : EvConfig
    Configuring --> Idle : EvConfig
}

NotShooting --> [*]
@enduml

```



```

@startuml
<style>
diamond {
    BackgroundColor #palegreen
    LineColor #green
    LineThickness 2.5
}
</style>
state state1

```

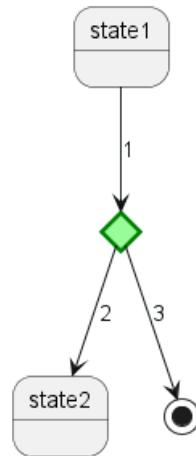


```

state state2
state choice1 <<choice>>
state end3    <<end>>

state1 --> choice1 : 1
choice1 --> state2  : 2
choice1 --> end3    : 3
@enduml

```



[Ref. GH-880]

## 9.21 Change state color and style (inline style)

You can change the color or style of individual state using the following notation:

- `#color ##[style]color`

With background color first (`#color`), then line style and line color (`##[style]color`).

```

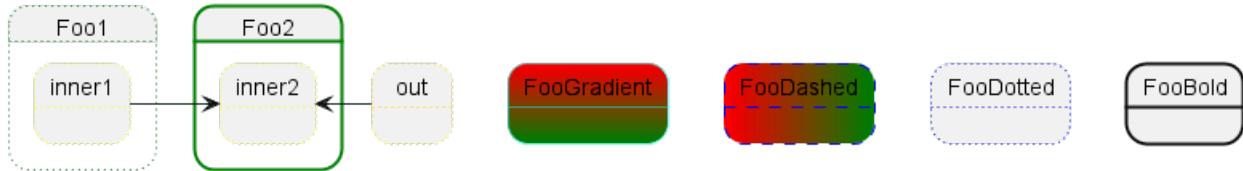
@startuml
state FooGradient #red-green ##00FFFF
state FooDashed #red|green ##[dashed]blue {
}
state FooDotted ##[dotted]blue {
}
state FooBold ##[bold] {
}
state Foo1 ##[dotted]green {
state inner1 ##[dotted]yellow
}

state out ##[dotted]gold

state Foo2 ##[bold]green {
state inner2 ##[dotted]yellow
}
inner1 -> inner2
out -> inner2
@enduml

```





[Ref. QA-1487]

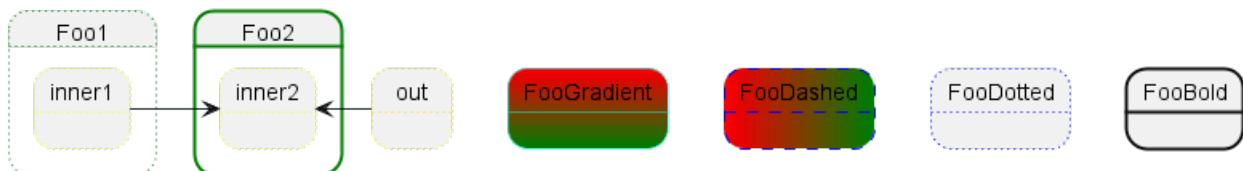
- #color;line:color;line.[bold|dashed|dotted];text:color

**TODO:** FIXME text:color seems not to be taken into account **TODO:** FIXME

```
@startuml
@startuml
state FooGradient #red-green;line:00FFFF
state FooDashed #red|green;line.dashed;line:blue {
}
state FooDotted #line.dotted;line:blue {
}
state FooBold #line.bold {
}
state Foo1 #line.dotted;line:green {
state inner1 #line.dotted;line:yellow
}

state out #line.dotted;line:gold

state Foo2 #line.bold;line:green {
state inner2 #line.dotted;line:yellow
}
inner1 -> inner2
out -> inner2
@enduml
@enduml
```



```
@startuml
state s1 : s1 description
state s2 #pink;line:red;line.bold;text:red : s2 description
state s3 #palegreen;line:green;line.dashed;text:green : s3 description
state s4 #aliceblue;line:blue;line.dotted;text:blue : s4 description
@enduml
```



[Adapted from QA-3770]

## 9.22 Alias

With State you can use alias, like:

```
@startuml
state alias1
```



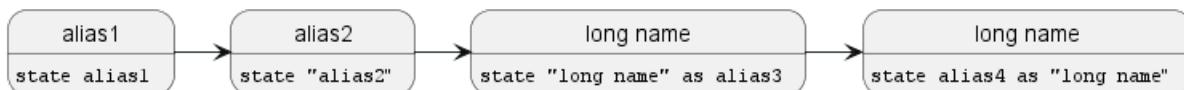
```

state "alias2"
state "long name" as alias3
state alias4 as "long name"

alias1 : ""state alias1"""
alias2 : ""state "alias2"""
alias3 : ""state "long name" as alias3"""
alias4 : ""state alias4 as "long name"""

alias1 -> alias2
alias2 -> alias3
alias3 -> alias4
@enduml

```



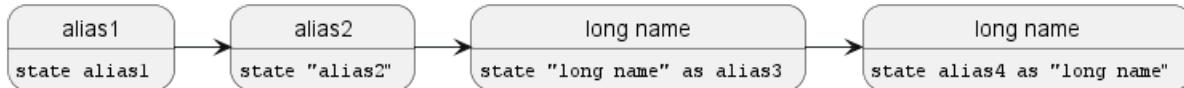
or:

```

@startuml
state alias1 : ""state alias1"""
state "alias2" : ""state "alias2"""
state "long name" as alias3 : ""state "long name" as alias3"""
state alias4 as "long name" : ""state alias4 as "long name"""

alias1 -> alias2
alias2 -> alias3
alias3 -> alias4
@enduml

```



## 9.23 Display JSON Data on State diagram

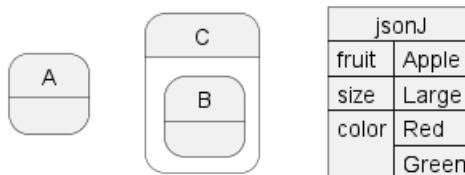
### 9.23.1 Simple example

```

@startuml
state "A" as stateA
state "C" as stateC {
    state B
}

json jsonJ {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml

```



[Ref. QA-17275]

For another example, see on JSON page.



## 10 Timing Diagram

This is still under construction. You can propose new features if you need some.

### 10.1 Declaring element or participant

You declare participant using the following keywords, depending on how you want them to be drawn.

Keyword	Description
analog	An analog signal is continuous, and the values are linearly interpolated between the given setpoints
binary	A binary signal restricted to only 2 states
clock	A clocked signal that repeatedly transitions from high to low, with a period, and an optional pulse and offset
concise	A simplified concise signal designed to show the movement of data (great for messages)
robust	A robust complex line signal designed to show the transition from one state to another (can have many segments)

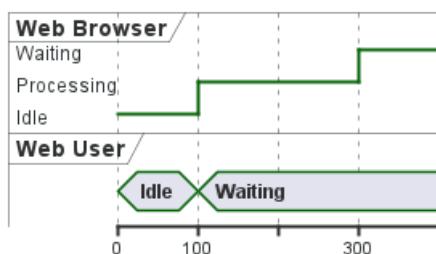
You define state change using the @ notation, and the is verb.

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

```
@0
WU is Idle
WB is Idle
```

```
@100
WU is Waiting
WB is Processing
```

```
@300
WB is Waiting
@enduml
```



```
@startuml
clock "Clock_0" as C0 with period 50
clock "Clock_1" as C1 with period 50 pulse 15 offset 10
binary "Binary" as B
concise "Concise" as C
robust "Robust" as R
analog "Analog" as A
```

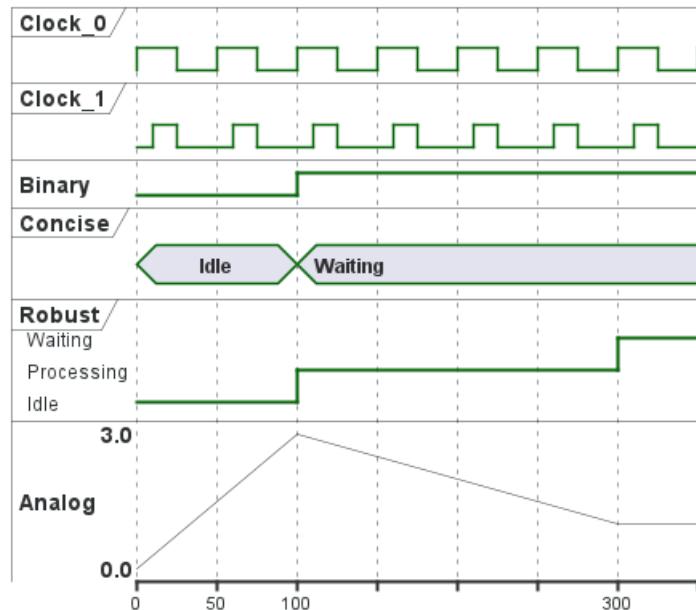
```
@0
C is Idle
R is Idle
A is 0
```

```
@100
B is high
C is Waiting
R is Processing
```



A is 3

```
@300
R is Waiting
A is 1
@enduml
```



[Ref. QA-14631, QA-14647 and QA-11288]

## 10.2 Binary and Clock

It's also possible to have binary and clock signal, using the following keywords:

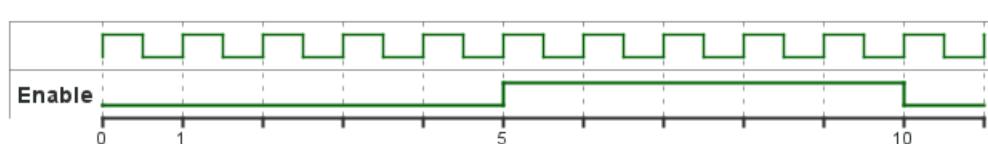
- `binary`
- `clock`

```
@startuml
clock clk with period 1
binary "Enable" as EN
```

```
@0
EN is low
```

```
@5
EN is high
```

```
@10
EN is low
@enduml
```



## 10.3 Adding message

You can add message using the following syntax.

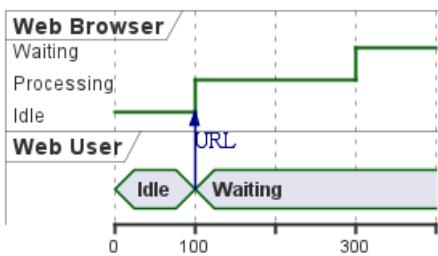


```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

```
@0
WU is Idle
WB is Idle
```

```
@100
WU -> WB : URL
WU is Waiting
WB is Processing
```

```
@300
WB is Waiting
@enduml
```



## 10.4 Relative time

It is possible to use relative time with @.

```
@startuml
robust "DNS Resolver" as DNS
robust "Web Browser" as WB
concise "Web User" as WU
```

```
@0
WU is Idle
WB is Idle
DNS is Idle
```

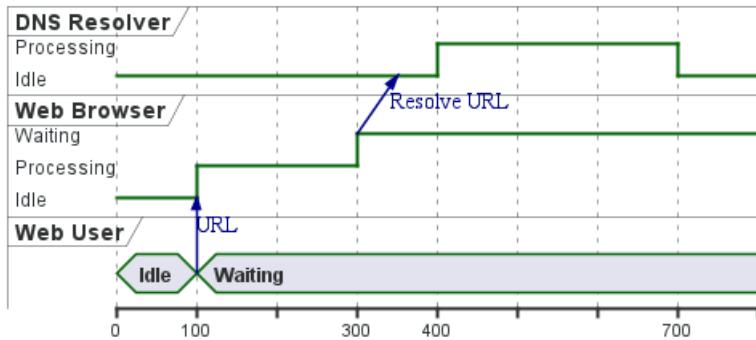
```
@+100
WU -> WB : URL
WU is Waiting
WB is Processing
```

```
@+200
WB is Waiting
WB -> DNS@+50 : Resolve URL
```

```
@+100
DNS is Processing
```

```
@+300
DNS is Idle
@enduml
```





## 10.5 Anchor Points

Instead of using absolute or relative time on an absolute time you can define a time as an anchor point by using the `as` keyword and starting the name with a `:`.

```
@XX as :<anchor point name>

@startuml
clock clk with period 1
binary "enable" as EN
concise "dataBus" as db

@0 as :start
@5 as :en_high
@10 as :en_low
@:en_high-2 as :en_highMinus2

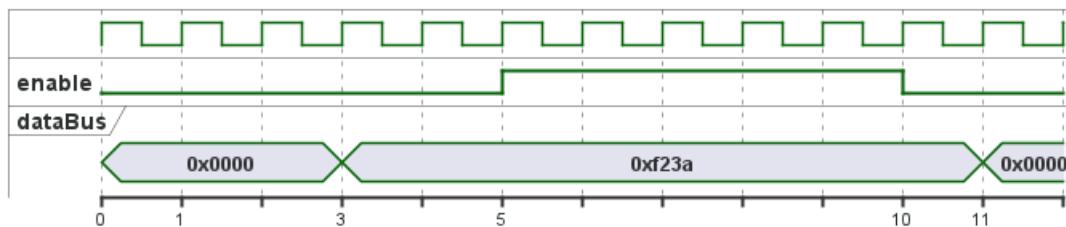
@:start
EN is low
db is "0x0000"

@:en_high
EN is high

@:en_low
EN is low

@:en_highMinus2
db is "0xf23a"

@:en_high+6
db is "0x0000"
@enduml
```



## 10.6 Participant oriented

Rather than declare the diagram in chronological order, you can define it by participant.

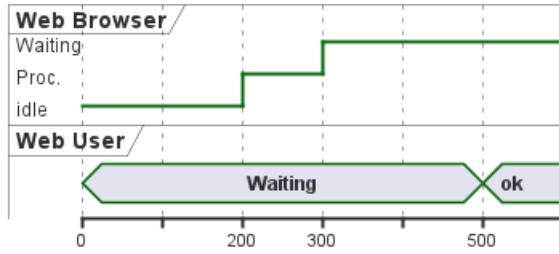
```
@startuml
```



```
robust "Web Browser" as WB
concise "Web User" as WU
```

```
@WB
0 is idle
+200 is Proc.
+100 is Waiting
```

```
@WU
0 is Waiting
+500 is ok
@enduml
```

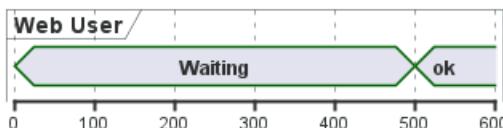


## 10.7 Setting scale

You can also set a specific scale.

```
@startuml
concise "Web User" as WU
scale 100 as 50 pixels
```

```
@WU
0 is Waiting
+500 is ok
@enduml
```



When using absolute Times/Dates, 1 "tick" is equivalent to 1 second.

```
@startuml
concise "Season" as S
'30 days is scaled to 50 pixels
scale 2592000 as 50 pixels
```

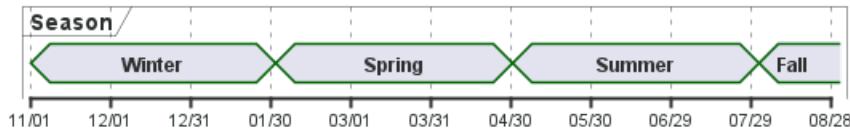
```
@2000/11/01
S is "Winter"
```

```
@2001/02/01
S is "Spring"
```

```
@2001/05/01
S is "Summer"
```

```
@2001/08/01
S is "Fall"
@enduml
```





## 10.8 Initial state

You can also define an initial state.

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

WB is Initializing

WU is Absent

```
@WB
0 is idle
+200 is Processing
+100 is Waiting
```

```
@WU
0 is Waiting
+500 is ok
@enduml
```



## 10.9 Intricated state

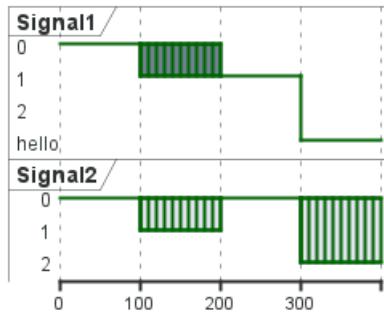
A signal could be in some undefined state.

### 10.9.1 Intricated or undefined robust state

```
@startuml
robust "Signal1" as S1
robust "Signal2" as S2
S1 has 0,1,2,hello
S2 has 0,1,2
@0
S1 is 0
S2 is 0
@100
S1 is {0,1} #SlateGrey
S2 is {0,1}
@200
S1 is 1
S2 is 0
@300
S1 is hello
```



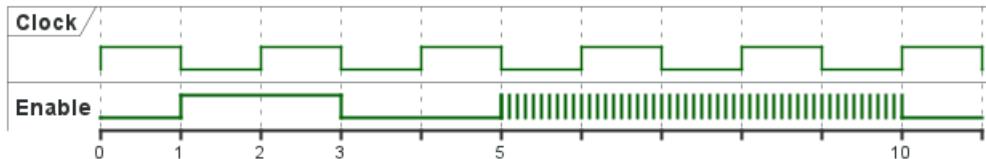
```
S2 is {0,2}
@enduml
```



### 10.9.2 Intricated or undefined binary state

```
@startuml
clock "Clock" as C with period 2
binary "Enable" as EN
```

```
@0
EN is low
@1
EN is high
@3
EN is low
@5
EN is {low,high}
@10
EN is low
@enduml
```



[Ref. QA-11936 and QA-15933]

## 10.10 Hidden state

It is also possible to hide some state.

```
@startuml
concise "Web User" as WU

@0
WU is {-}

@100
WU is A1

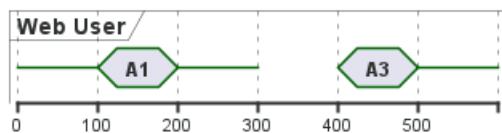
@200
WU is {-}

@300
WU is {hidden}
```



```
@400
WU is A3
```

```
@500
WU is {-}
@enduml
```



```
@startuml
scale 1 as 50 pixels
```

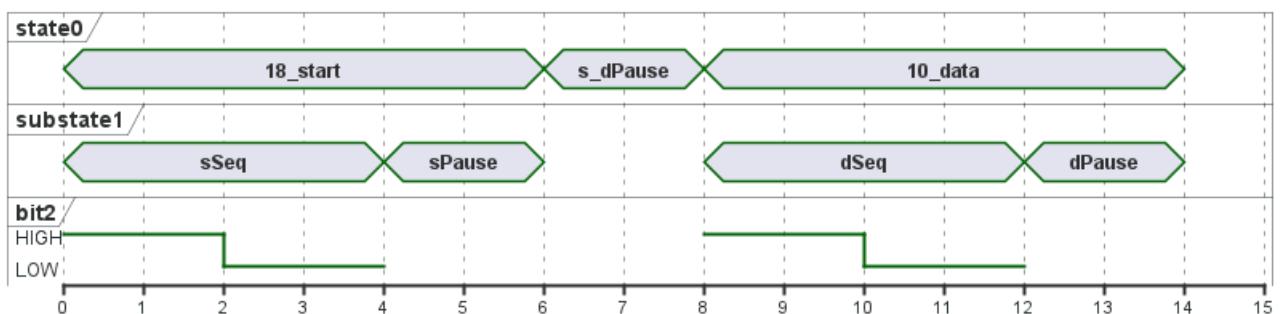
```
concise state0
concise substate1
robust bit2
```

```
bit2 has HIGH,LOW
```

```
@state0
0 is 18_start
6 is s_dPause
8 is 10_data
14 is {hidden}
```

```
@substate1
0 is sSeq
4 is sPause
6 is {hidden}
8 is dSeq
12 is dPause
14 is {hidden}
```

```
@bit2
0 is HIGH
2 is LOW
4 is {hidden}
8 is HIGH
10 is LOW
12 is {hidden}
@enduml
```



[Ref. QA-12222]



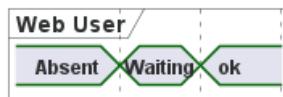
## 10.11 Hide time axis

It is possible to hide time axis.

```
@startuml
hide time-axis
concise "Web User" as WU
```

WU is Absent

```
@WU
0 is Waiting
+500 is ok
@enduml
```



## 10.12 Using Time and Date

It is possible to use time or date.

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

@2019/07/02

WU is Idle

WB is Idle

@2019/07/04

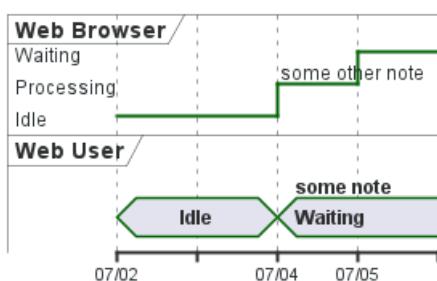
WU is Waiting : some note

WB is Processing : some other note

@2019/07/05

WB is Waiting

@enduml



@startuml

```
robust "Web Browser" as WB
concise "Web User" as WU
```

@1:15:00

WU is Idle

WB is Idle

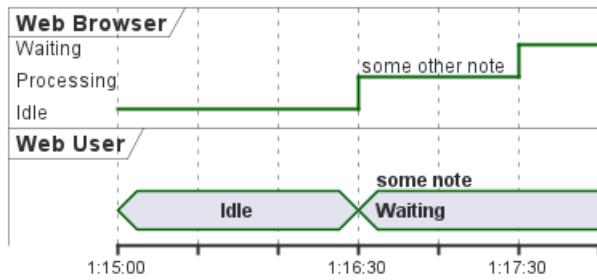
@1:16:30

WU is Waiting : some note

WB is Processing : some other note



```
@1:17:30
WB is Waiting
@enduml
```



### 10.13 Adding constraint

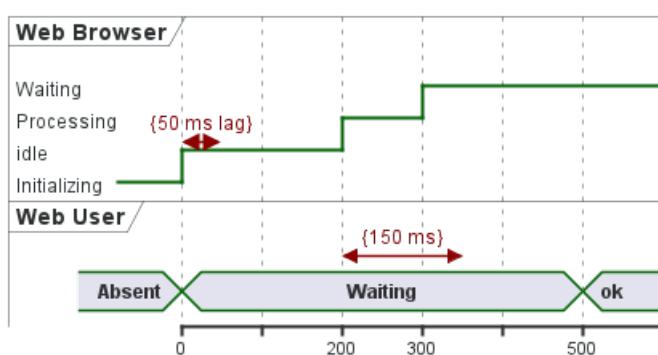
It is possible to display time constraints on the diagrams.

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

```
WB is Initializing
WU is Absent
```

```
@WB
0 is idle
+200 is Processing
+100 is Waiting
WB00 <-> @050 : {50 ms lag}
```

```
@WU
0 is Waiting
+500 is ok
@200 <-> @+150 : {150 ms}
@enduml
```



### 10.14 Highlighted period

You can highlight a part of diagram.

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

```
@0
```



WU is Idle  
WB is Idle

@100  
WU -> WB : URL  
WU is Waiting #LightCyan;line:Aqua

@200  
WB is Proc.

@300  
WU -> WB@350 : URL2  
WB is Waiting

@+200  
WU is ok

@+200  
WB is Idle

highlight 200 to 450 #Gold;line:DimGrey : This is my caption  
highlight 600 to 700 : This is another\ nhighlight  
@enduml



[Ref. QA-10868]

## 10.15 Using notes

You can use the `note top of` and `note bottom of` keywords to define notes related to a single object or participant (*available only for concise or binary object*).

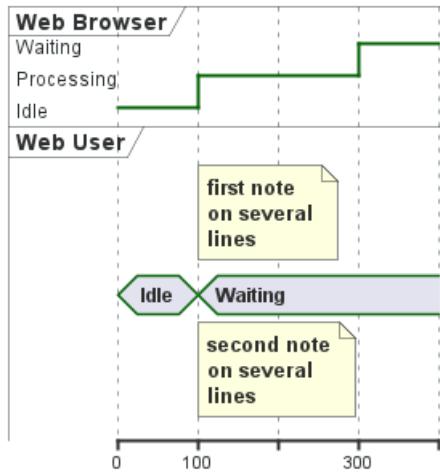
```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU

@0
WU is Idle
WB is Idle

@100
WU is Waiting
WB is Processing
note top of WU : first note\nnon several\nlines
note bottom of WU : second note\nnon several\nlines

@300
WB is Waiting
@enduml
```





[Ref. QA-6877, GH-1465]

## 10.16 Adding texts

You can optionally add a title, a header, a footer, a legend and a caption:

```
@startuml
Title This is my title
header: some header
footer: some footer
legend
Some legend
end legend
caption some caption

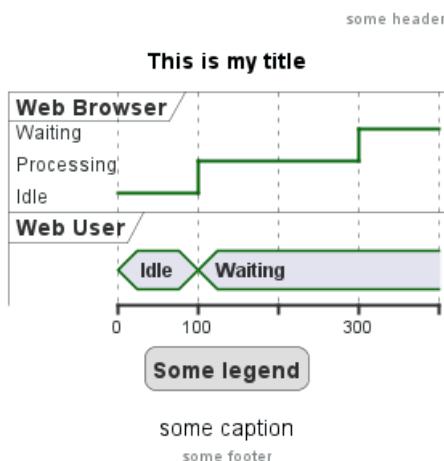
robust "Web Browser" as WB
concise "Web User" as WU

@0
WU is Idle
WB is Idle

@100
WU is Waiting
WB is Processing

@300
WB is Waiting
@enduml
```





## 10.17 Complete example

Thanks to Adam Rosien for this example.

```

@startuml
concise "Client" as Client
concise "Server" as Server
concise "Response freshness" as Cache

Server is idle
Client is idle

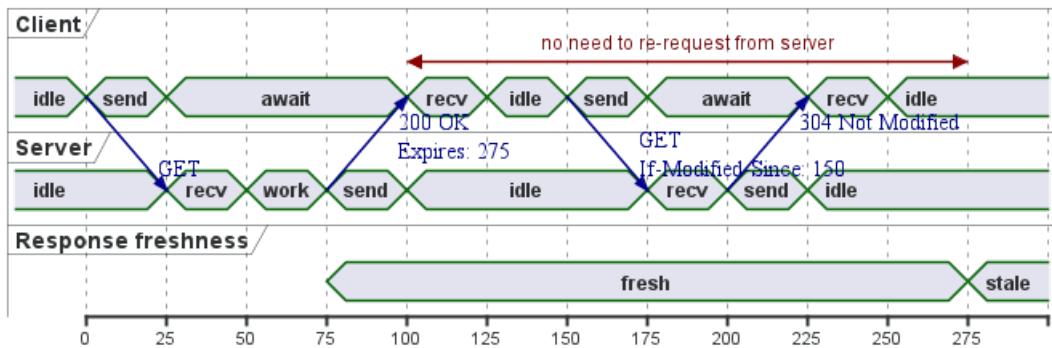
@Client
0 is send
Client -> Server@+25 : GET
+25 is await
+75 is recv
+25 is idle
+25 is send
Client -> Server@+25 : GET\nIf-Modified-Since: 150
+25 is await
+50 is recv
+25 is idle
@100 <-> @275 : no need to re-request from server

@Server
25 is recv
+25 is work
+25 is send
Server -> Client@+25 : 200 OK\nExpires: 275
+25 is idle
+75 is recv
+25 is send
Server -> Client@+25 : 304 Not Modified
+25 is idle

@Cache
75 is fresh
+200 is stale
@enduml

```





## 10.18 Digital Example

```
@startuml
scale 5 as 150 pixels

clock clk with period 1
binary "enable" as en
binary "R/W" as rw
binary "data Valid" as dv
concise "dataBus" as db
concise "address bus" as addr
```

```
@6 as :write_beg
@10 as :write_end
```

```
@15 as :read_beg
@19 as :read_end
```

```
@0
en is low
db is "0x0"
addr is "0x03f"
rw is low
dv is 0
```

```
@:write_beg-3
en is high
@:write_beg-2
db is "0xDEADBEEF"
@:write_beg-1
dv is 1
@:write_beg
rw is high
```

```
@:write_end
rw is low
dv is low
@:write_end+1
rw is low
db is "0x0"
addr is "0x23"
```

```
@12
dv is high
```



```

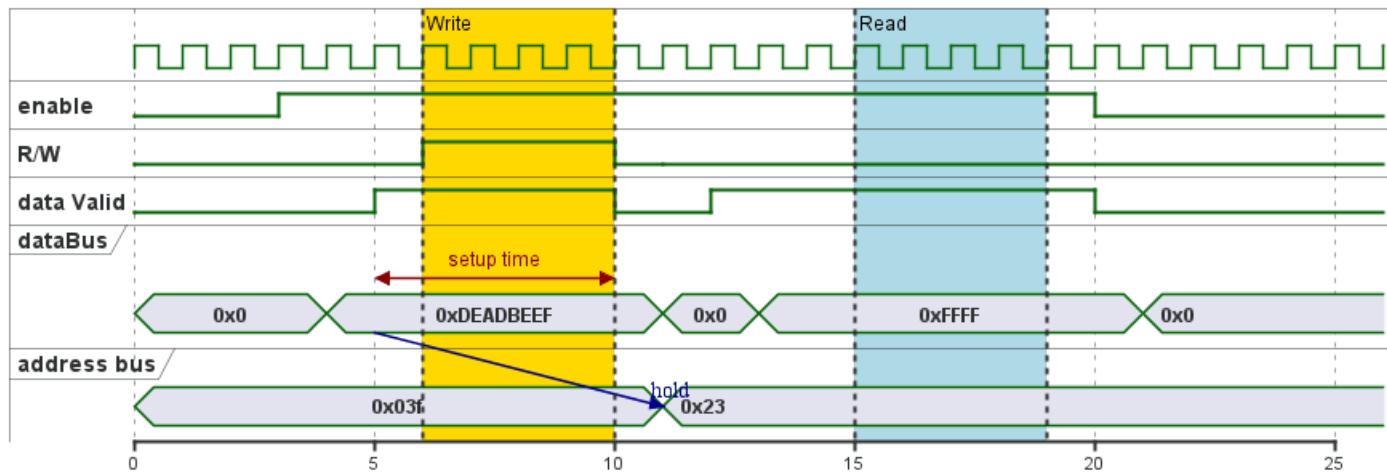
@13
db is "0xFFFF"

@20
en is low
dv is low
@21
db is "0x0"

highlight :write_beg to :write_end #Gold:Write
highlight :read_beg to :read_end #lightBlue:Read

db@:write_beg-1 <-> @:write_end : setup time
db@:write_beg-1 -> addr@:write_end+1 : hold
@enduml

```



## 10.19 Adding color

You can add color.

```

@startuml
concise "LR" as LR
concise "ST" as ST

LR is AtPlace #palegreen
ST is AtLoad #gray

```

```

@LR
0 is Lowering
100 is Lowered #pink
350 is Releasing

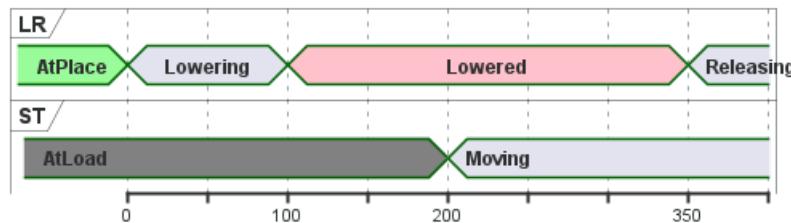
```

```

@ST
200 is Moving
@enduml

```





[Ref. QA-5776]

## 10.20 Using (global) style

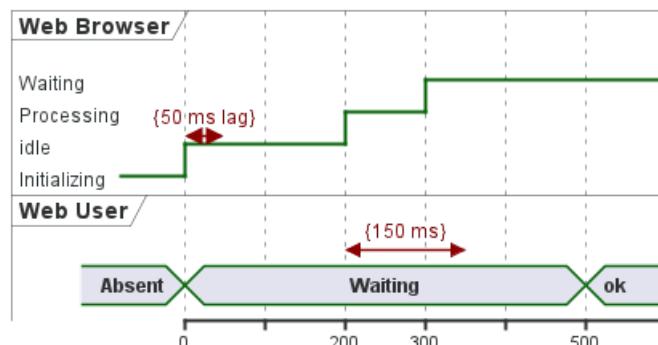
### 10.20.1 Without style (by default)

```
@startuml
robust "Web Browser" as WB
concise "Web User" as WU
```

WB is Initializing  
WU is Absent

```
@WB
0 is idle
+200 is Processing
+100 is Waiting
WB@0 <-> @50 : {50 ms lag}
```

```
@WU
0 is Waiting
+500 is ok
@200 <-> @+150 : {150 ms}
@enduml
```



### 10.20.2 With style

You can use style to change rendering of elements.

```
@startuml
<style>
timingDiagram {
    document {
        BackGroundColor SandyBrown
    }
    constraintArrow {
        LineStyle 2-1
        LineThickness 3
        LineColor Blue
    }
}
```



```

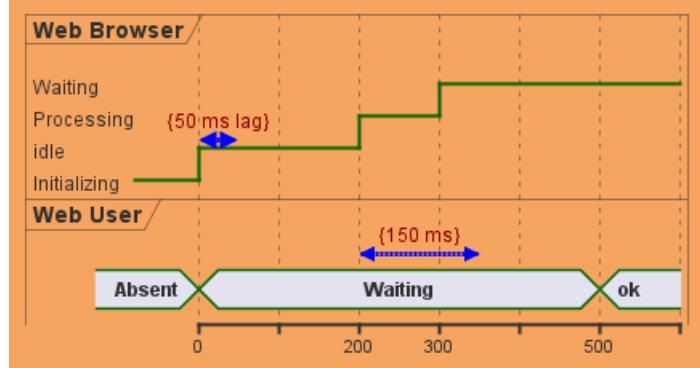
}
}
</style>
robust "Web Browser" as WB
concise "Web User" as WU

WB is Initializing
WU is Absent

@WB
0 is idle
+200 is Processing
+100 is Waiting
WB00 <-> @50 : {50 ms lag}

@WU
0 is Waiting
+500 is ok
@200 <-> @+150 : {150 ms}
@enduml

```



[Ref. QA-14340]

## 10.21 Applying Colors to specific lines

You can use the `<style>` tags and stereotyping to give a name to line attributes.

```

@startuml
<style>
timingDiagram {
    .red {
        LineColor red
    }
    .blue {
        LineColor blue
        LineThickness 5
    }
}
</style>

clock clk with period 1
binary "Input Signal 1" as IS1
binary "Input Signal 2" as IS2 <<blue>>
binary "Output Signal 1" as OS1 <<red>>

@0
IS1 is low

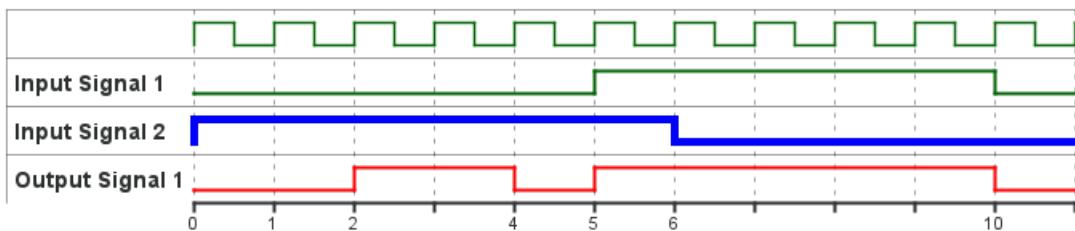
```



```

IS2 is high
OS1 is low
@2
OS1 is high
@4
OS1 is low
@5
IS1 is high
OS1 is high
@6
IS2 is low
@10
IS1 is low
OS1 is low
@enduml

```



[Ref. QA-15870]

## 10.22 Compact mode

You can use `compact` command to compact the timing layout.

### 10.22.1 By default

```

@startuml
robust "Web Browser" as WB
concise "Web User" as WU
robust "Web Browser2" as WB2

@0
WU is Waiting
WB is Idle
WB2 is Idle

@200
WB is Proc.

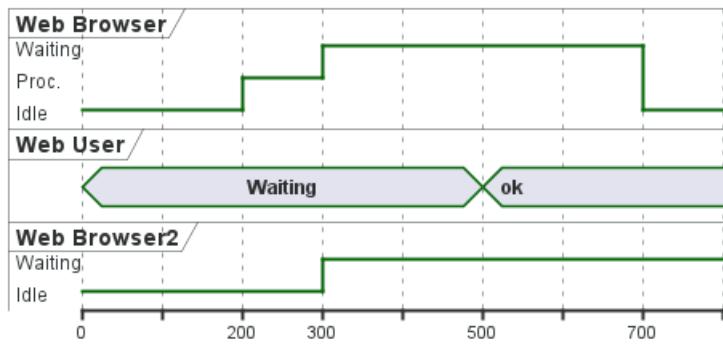
@300
WB is Waiting
WB2 is Waiting

@500
WU is ok

@700
WB is Idle
@enduml

```





### 10.22.2 Global mode with mode compact

```
@startuml
mode compact
robust "Web Browser" as WB
concise "Web User" as WU
robust "Web Browser2" as WB2
```

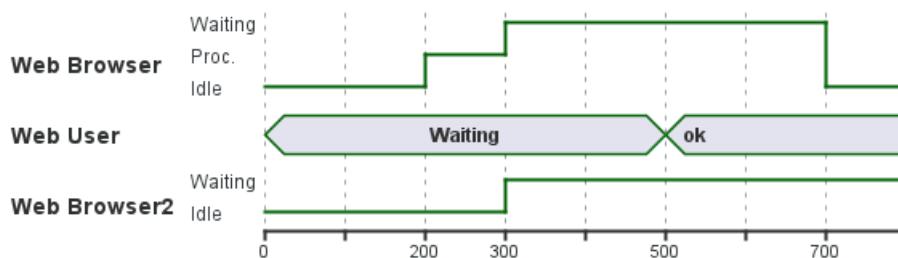
```
@0
WU is Waiting
WB is Idle
WB2 is Idle
```

```
@200
WB is Proc.
```

```
@300
WB is Waiting
WB2 is Waiting
```

```
@500
WU is ok
```

```
@700
WB is Idle
@enduml
```



### 10.22.3 Local mode with only compact on element

```
@startuml
compact robust "Web Browser" as WB
compact concise "Web User" as WU
robust "Web Browser2" as WB2
```

```
@0
WU is Waiting
WB is Idle
```



WB2 is Idle

@200

WB is Proc.

@300

WB is Waiting

WB2 is Waiting

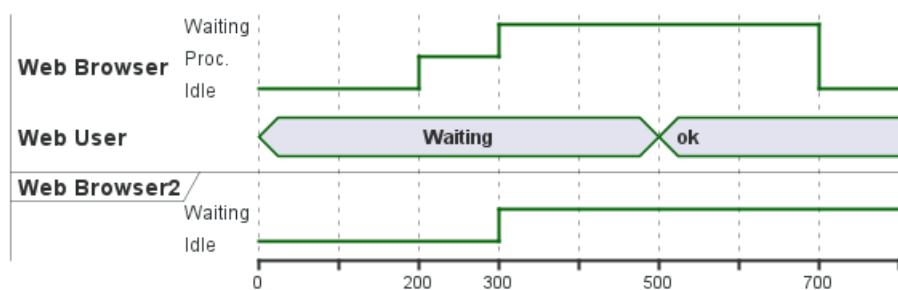
@500

WU is ok

@700

WB is Idle

@enduml



[Ref. QA-11130]



## 11 Display JSON Data

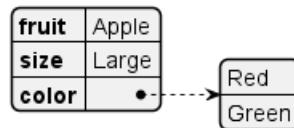
JSON format is widely used in software.

You can use PlantUML to visualize your data.

To activate this feature, the diagram must:

- begin with `@startjson` keyword
- end with `@endjson` keyword.

```
@startjson
{
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@endjson
```

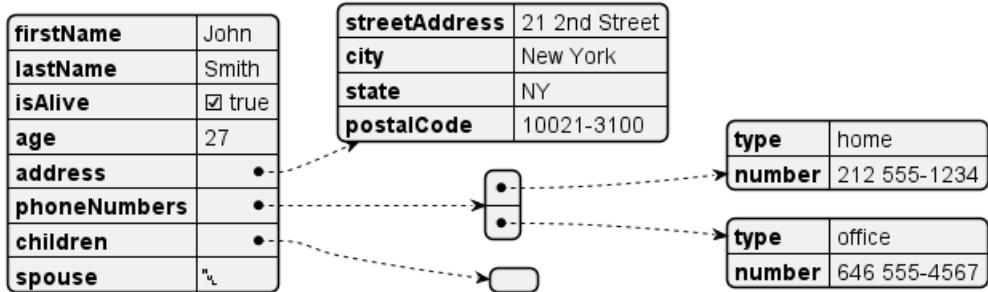


### 11.1 Complex example

You can use complex JSON structure.

```
@startjson
{
    "firstName": "John",
    "lastName": "Smith",
    "isAlive": true,
    "age": 27,
    "address": {
        "streetAddress": "21 2nd Street",
        "city": "New York",
        "state": "NY",
        "postalCode": "10021-3100"
    },
    "phoneNumbers": [
        {
            "type": "home",
            "number": "212 555-1234"
        },
        {
            "type": "office",
            "number": "646 555-4567"
        }
    ],
    "children": [],
    "spouse": null
}
@endjson
```

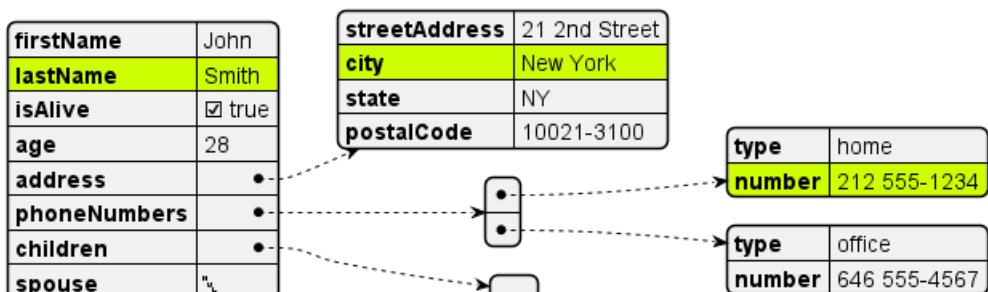




## 11.2 Highlight parts

```

@startjson
#highlight "lastName"
#highlight "address" / "city"
#highlight "phoneNumbers" / "0" / "number"
{
  "firstName": "John",
  "lastName": "Smith",
  "isAlive": true,
  "age": 28,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": "10021-3100"
  },
  "phoneNumbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "office",
      "number": "646 555-4567"
    }
  ],
  "children": [],
  "spouse": null
}
@endjson
  
```



## 11.3 Using different styles for highlight

It is possible to have different styles for different highlights.

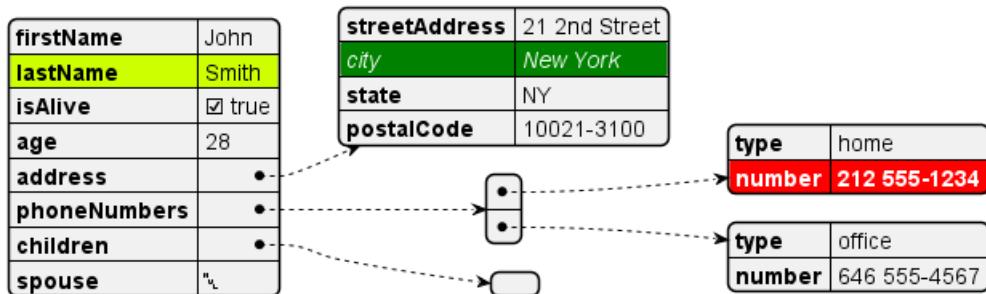
```
@startjson
```



```

<style>
.h1 {
    BackGroundColor green
    FontColor white
    FontStyle italic
}
.h2 {
    BackGroundColor red
    FontColor white
    FontStyle bold
}
</style>
#highlight "lastName"
#highlight "address" / "city" <<h1>>
#highlight "phoneNumbers" / "0" / "number" <<h2>>
{
    "firstName": "John",
    "lastName": "Smith",
    "isAlive": true,
    "age": 28,
    "address": {
        "streetAddress": "21 2nd Street",
        "city": "New York",
        "state": "NY",
        "postalCode": "10021-3100"
    },
    "phoneNumbers": [
        {
            "type": "home",
            "number": "212 555-1234"
        },
        {
            "type": "office",
            "number": "646 555-4567"
        }
    ],
    "children": [],
    "spouse": null
}
@endjson

```



[Ref. QA-15756, GH-1393]

## 11.4 JSON basic element

### 11.4.1 Synthesis of all JSON basic element

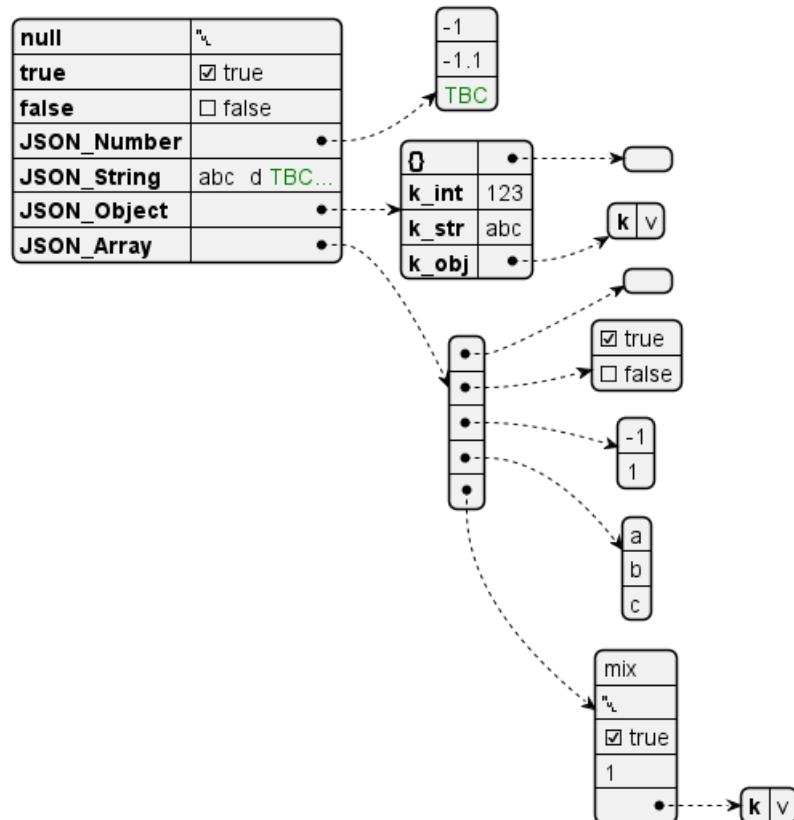
```
@startjson
{
```



```

>null": null,
>true": true,
>false": false,
"JSON_Number": [-1, -1.1, "<color:green>TBC"],
"JSON_String": "a\nb\rc\td <color:green>TBC...",
"JSON_Object": {
    "{}": {},
    "k_int": 123,
    "k_str": "abc",
    "k_obj": {"k": "v"}
},
"JSON_Array" : [
    [],
    [true, false],
    [-1, 1],
    ["a", "b", "c"],
    ["mix", null, true, 1, {"k": "v"}]
]
}
@endjson

```



## 11.5 JSON array or table

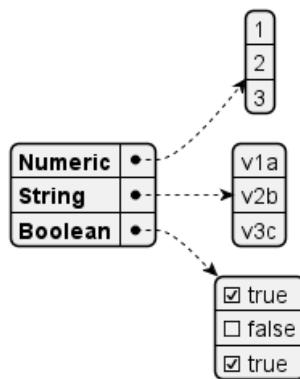
### 11.5.1 Array type

```

@startjson
{
"Numeric": [1, 2, 3],
"String": ["v1a", "v2b", "v3c"],
"Boolean": [true, false, true]
}
@endjson

```





### 11.5.2 Minimal array or table

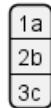
### 11.5.3 Number array

```
@startjson
[1, 2, 3]
@endjson
```



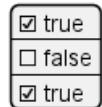
### 11.5.4 String array

```
@startjson
["1a", "2b", "3c"]
@endjson
```



### 11.5.5 Boolean array

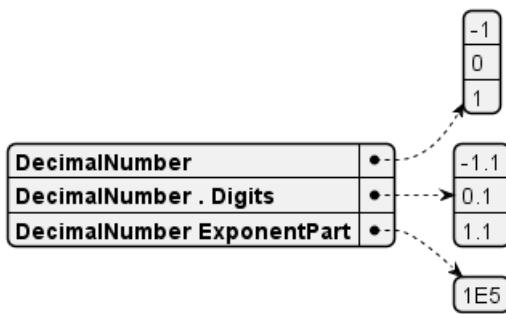
```
@startjson
[true, false, true]
@endjson
```



## 11.6 JSON numbers

```
@startjson
{
  "DecimalNumber": [-1, 0, 1],
  "DecimalNumber . Digits": [-1.1, 0.1, 1.1],
  "DecimalNumber ExponentPart": [1E5]
}
@endjson
```





## 11.7 JSON strings

### 11.7.1 JSON Unicode

On JSON you can use Unicode directly or by using escaped form like .

```

@startjson
{
    "<color:blue><b>code": "<color:blue><b>value",
    "a\\u005Cb": "a\u005Cb",
    "\\uD83D\\uDE10": "\uD83D\uDE10",
    " ":
}
@endjson

```

code	value
a\u005Cb	a\b
\uD83D\uDE10	(?)
(?)	(?)

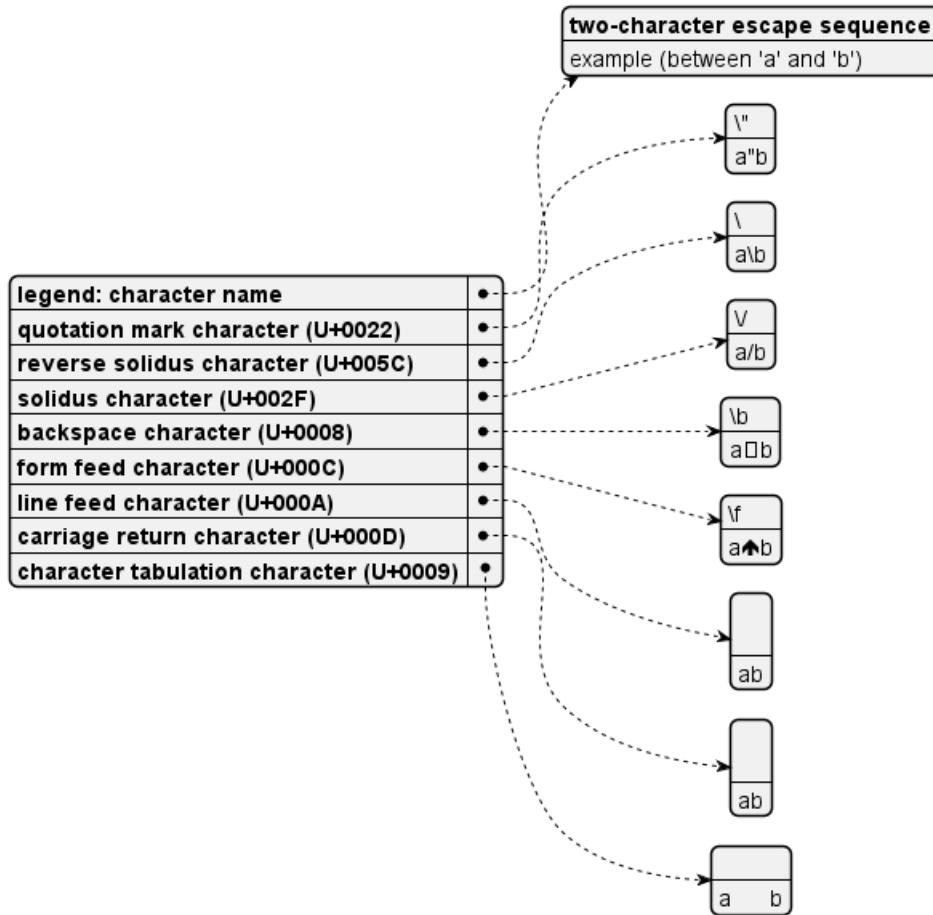
### 11.7.2 JSON two-character escape sequence

```

@startjson
{
    "**legend**: character name":
    "quotation mark character (U+0022)": ["\"\"", "a\"b"],
    "reverse solidus character (U+005C)": ["\\\\\\\", "a\\\"b"],
    "solidus character (U+002F)": ["\\\\\\/", "a\\/b"],
    "backspace character (U+0008)": ["\\b", "a\\bb"],
    "form feed character (U+000C)": ["\\f", "a\\fb"],
    "line feed character (U+000A)": ["\\n", "a\\nb"],
    "carriage return character (U+000D)": ["\\r", "a\\rb"],
    "character tabulation character (U+0009)": ["\\t", "a\\tb"]
}
@endjson

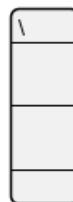
```





**TODO:** FIXME FIXME or not , on the same item as management in PlantUML See Report Bug on QA-13066 **TODO:** FIXME

```
@startjson
[
  "\\\\",
  "\\n",
  "\\r",
  "\\t"
]
@endjson
```



## 11.8 Minimal JSON examples

```
@startjson
"Hello world!"
@endjson
```

Hello world!



```
@startjson
42
@endjson
```

```
@startjson
true
@endjson
```

(Examples come from STD 90 - Examples)

## 11.9 Empty table or list

```
@startjson
{
  "empty_tab": [],
  "empty_list": []
}
@endjson
```

<b>empty_tab</b>	•	→	○
<b>empty_list</b>	•	→	○

[Ref. QA-14397]

## 11.10 Using (global) style

### 11.10.1 Without style (*by default*)

```
@startjson
#highlight "1" / "hr"
[
  {
    "name": "Mark McGwire",
    "hr": 65,
    "avg": 0.278
  },
  {
    "name": "Sammy Sosa",
    "hr": 63,
    "avg": 0.288
  }
]
@endjson
```

•	→	<b>name</b>   Mark McGwire	
•	→	<b>hr</b>   65	
•	→	<b>avg</b>   0.278	

•	→	<b>name</b>   Sammy Sosa	
•	→	<b>hr</b>   63	
•	→	<b>avg</b>   0.288	

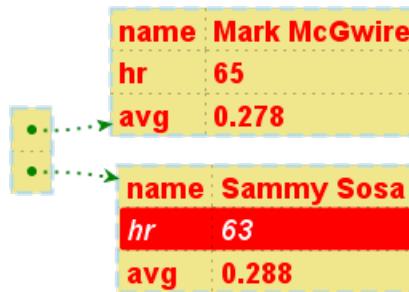


### 11.10.2 With style

You can use style to change rendering of elements.

```
@startjson
<style>
jsonDiagram {
    node {
        BackGroundColor Khaki
        LineColor lightblue
        FontName Helvetica
        FontColor red
        FontSize 18
        FontStyle bold
        RoundCorner 0
        LineThickness 2
        LineStyle 10-5
        separator {
            LineThickness 0.5
            LineColor black
            LineStyle 1-5
        }
    }
    arrow {
        BackGroundColor lightblue
        LineColor green
        LineThickness 2
        LineStyle 2-5
    }
    highlight {
        BackGroundColor red
        FontColor white
        FontStyle italic
    }
}
</style>
#highlight "1" / "hr"
[
{
    "name": "Mark McGwire",
    "hr": 65,
    "avg": 0.278
},
{
    "name": "Sammy Sosa",
    "hr": 63,
    "avg": 0.288
}
]
@endjson
```





[Adapted from QA-13123 and QA-13288]

## 11.11 Display JSON Data on Class or Object diagram

### 11.11.1 Simple example

```
@startuml
class Class
object Object
json JSON {
    "fruit": "Apple",
    "size": "Large",
    "color": ["Red", "Green"]
}
@enduml
```



JSON	
fruit	Apple
size	Large
color	Red
	Green

[Ref. QA-15481]

### 11.11.2 Complex example: with all JSON basic element

```
@startuml
json "<b>JSON basic element</b>" as J {
    "null": null,
    "true": true,
    "false": false,
    "JSON_Number": [-1, -1.1, "<color:green>TBC"],
    "JSON_String": "a\nb\rc\td <color:green>TBC...",
    "JSON_Object": {
        "{}": {},
        "k_int": 123,
        "k_str": "abc",
        "k_obj": {"k": "v"}
    },
    "JSON_Array" : [
        [],
        [true, false],
        [-1, 1],
        ...
    ]
}
```



```

["a", "b", "c"],
["mix", null, true, 1, {"k": "v"}]
]
}
@enduml

```

JSON basic element	
null	null
true	true
false	false
JSON_Number	-1
	-1.1
	TBC
JSON_String	abc d TBC...
JSON_Object	{}
	k_int 123
	k_str abc
	k_obj k   v
JSON_Array	true
	false
	-1
	1
	a
	b
	c
	mix
	null
	true
	1
	k   v

## 11.12 Display JSON Data on Deployment (Usecase, Component, Deployment) diagram

### 11.12.1 Simple example

```

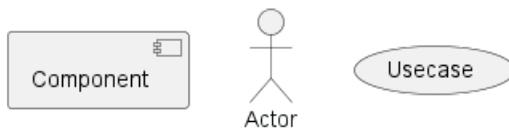
@startuml
allowmixing

component Component
actor Actor
usecase Usecase
() Interface
node Node
cloud Cloud

json JSON {
    "fruit":"Apple",
    "size":"Large",
    "color": ["Red", "Green"]
}
@enduml

```





JSON	
fruit	Apple
size	Large
color	Red
	Green

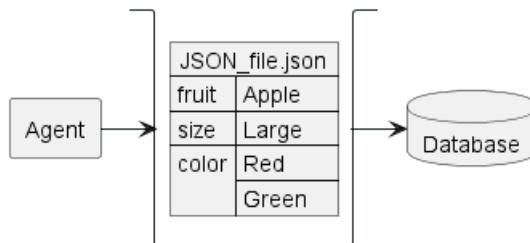
[Ref. QA-15481]

Complex example: with arrow

```
@startuml
allowmixing

agent Agent
stack {
    json "JSON_file.json" as J {
        "fruit":"Apple",
        "size":"Large",
        "color": ["Red", "Green"]
    }
}
database Database

Agent -> J
J -> Database
@enduml
```



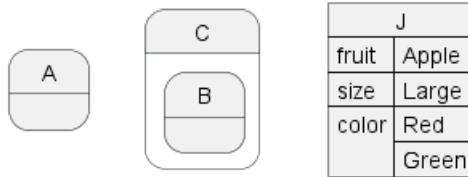
## 11.13 Display JSON Data on State diagram

### 11.13.1 Simple example

```
@startuml
state "A" as stateA
state "C" as stateC {
    state B
}
```



```
json J {  
    "fruit": "Apple",  
    "size": "Large",  
    "color": ["Red", "Green"]  
}  
@enduml
```



[Ref. QA-17275]



## 12 Display YAML Data

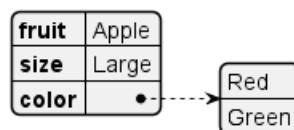
YAML format is widely used in software.

You can use PlantUML to visualize your data.

To activate this feature, the diagram must:

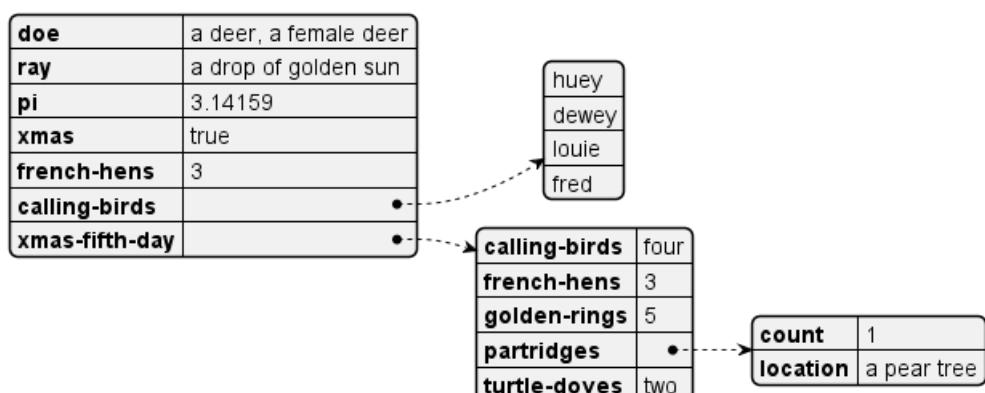
- begin with `@startyaml` keyword
- end with `@endyaml` keyword.

```
@startyaml
fruit: Apple
size: Large
color:
  - Red
  - Green
@endyaml
```



### 12.1 Complex example

```
@startyaml
doe: "a deer, a female deer"
ray: "a drop of golden sun"
pi: 3.14159
xmas: true
xmas-fifth-day:
  calling-birds:
    - huey
    - dewey
    - louie
    - fred
  french-hens: 3
  golden-rings: 5
  partridges:
    count: 1
    location: "a pear tree"
  turtle-doves: two
@endyaml
```



## 12.2 Specific key (with symbols or unicode)

```
@startyaml
$fruit: Apple
$size: Large
&color: Red
: Heart
%: Per mille
@endyaml
```

<b>@fruit</b>	Apple
<b>\$size</b>	Large
<b>&amp;color</b>	Red
♥	Heart
%	Per mille

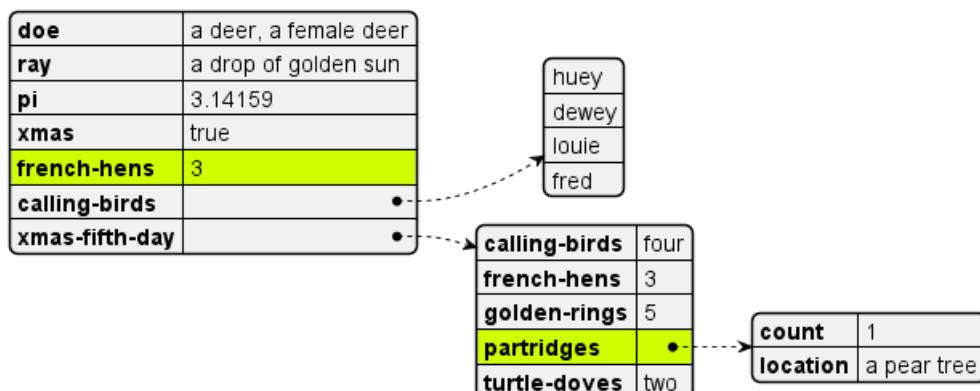
[Ref. QA-13376]

## 12.3 Highlight parts

### 12.3.1 Normal style

```
@startyaml
#highlight "french-hens"
#highlight "xmas-fifth-day" / "partridges"

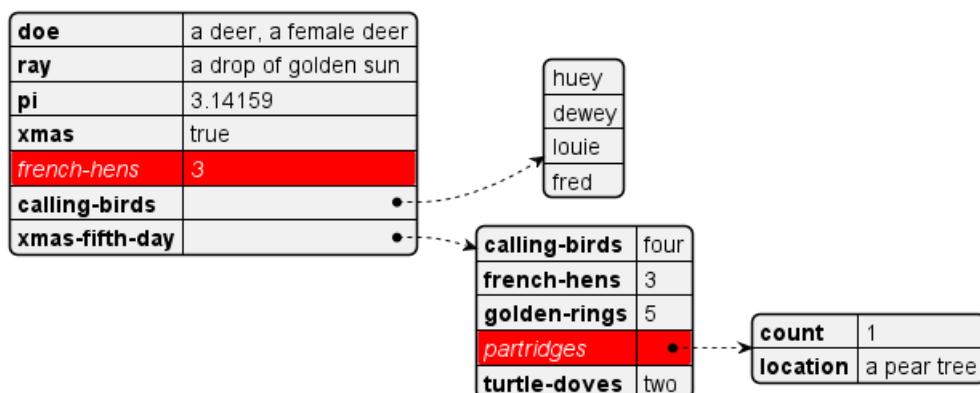
doe: "a deer, a female deer"
ray: "a drop of golden sun"
pi: 3.14159
xmas: true
french-hens: 3
calling-birds:
- huey
- dewey
- louie
- fred
xmas-fifth-day:
calling-birds: four
french-hens: 3
golden-rings: 5
partridges:
count: 1
location: "a pear tree"
turtle-doves: two
@endyaml
```



### 12.3.2 Customised style

```
@startyaml
<style>
yamlDiagram {
    highlight {
        BackGroundColor red
        FontColor white
        FontStyle italic
    }
}
</style>
#highlight "french-hens"
#highlight "xmas-fifth-day" / "partridges"

doe: "a deer, a female deer"
ray: "a drop of golden sun"
pi: 3.14159
xmas: true
french-hens: 3
calling-birds:
- huey
- dewey
- louie
- fred
xmas-fifth-day:
calling-birds: four
french-hens: 3
golden-rings: 5
partridges:
count: 1
location: "a pear tree"
turtle-doves: two
@endyaml
```



[Ref. QA-13288]

## 12.4 Using different styles for highlight

It is possible to have different styles for different highlights.

```
@startyaml
<style>
.h1 {
    BackGroundColor green
    FontColor white
}
```

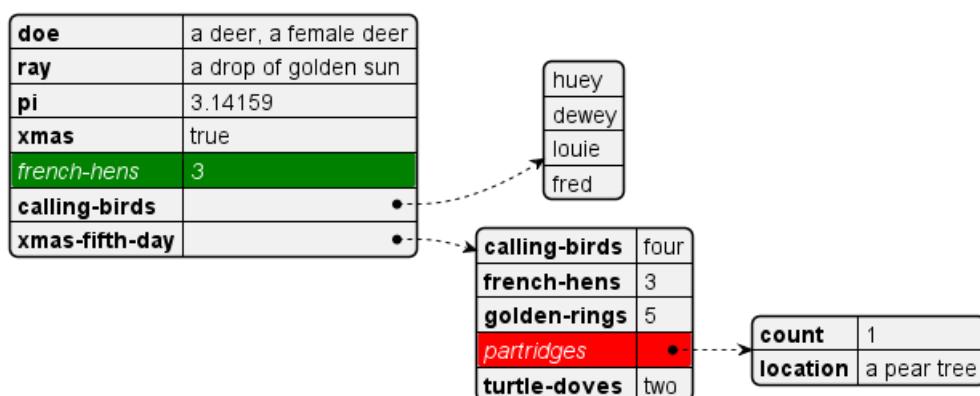


```

    FontStyle italic
}
.h2 {
    BackGroundColor red
    FontColor white
    FontStyle italic
}
</style>
#highlight "french-hens" <<h1>>
#highlight "xmas-fifth-day" / "partridges" <<h2>>

doe: "a deer, a female deer"
ray: "a drop of golden sun"
pi: 3.14159
xmas: true
french-hens: 3
calling-birds:
- huey
- dewey
- louie
- fred
xmas-fifth-day:
calling-birds: four
french-hens: 3
golden-rings: 5
partridges:
count: 1
location: "a pear tree"
turtle-doves: two
@endyaml

```



[Ref. QA-15756, GH-1393]

## 12.5 Using (global) style

### 12.5.1 Without style (*by default*)

@startyaml

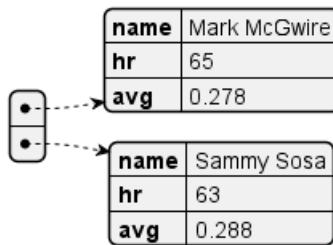
```

-
  name: Mark McGwire
  hr: 65
  avg: 0.278
-
  name: Sammy Sosa
  hr: 63

```



```
avg: 0.288
@endyaml
```

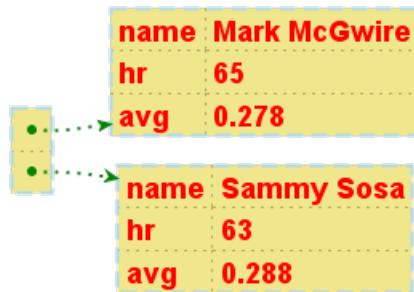


### 12.5.2 With style

You can use style to change rendering of elements.

```
@startyaml
<style>
yamlDiagram {
    node {
        BackGroundColor lightblue
        LineColor lightblue
        FontName Helvetica
        FontColor red
        FontSize 18
        FontStyle bold
        BackGroundColor Khaki
        RoundCorner 0
        LineThickness 2
        LineStyle 10-5
        separator {
            LineThickness 0.5
            LineColor black
            LineStyle 1-5
        }
    }
    arrow {
        BackGroundColor lightblue
        LineColor green
        LineThickness 2
        LineStyle 2-5
    }
}
</style>
-
  name: Mark McGwire
  hr: 65
  avg: 0.278
-
  name: Sammy Sosa
  hr: 63
  avg: 0.288
@endyaml
```





[Ref. QA-13123]

## 13 Network diagram (nwdiag)

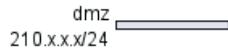
nwdiag has been created by Takeshi Komiya and allows to quickly draw network diagrams. So we thank him for his creation!

Since the syntax is clear and simple, this has been integrated within PlantUML. We reuse here the examples that Takeshi has documented.

### 13.1 Simple diagram

#### 13.1.1 Define a network

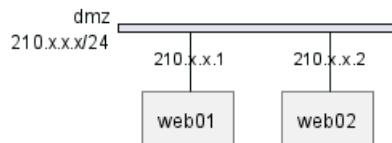
```
@startuml
nwdiag {
    network dmz {
        address = "210.x.x.x/24"
    }
}
@enduml
```



#### 13.1.2 Define some elements or servers on a network

```
@startuml
nwdiag {
    network dmz {
        address = "210.x.x.x/24"

        web01 [address = "210.x.x.1"];
        web02 [address = "210.x.x.2"];
    }
}
@enduml
```



#### 13.1.3 Full example

```
@startuml
nwdiag {
    network dmz {
        address = "210.x.x.x/24"

        web01 [address = "210.x.x.1"];
        web02 [address = "210.x.x.2"];
    }

    network internal {
        address = "172.x.x.x/24";

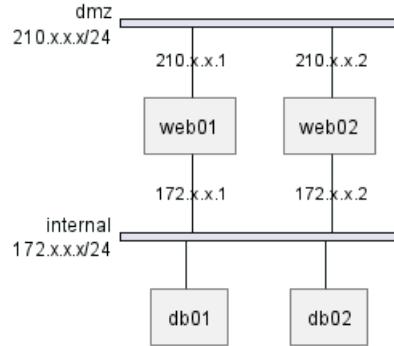
        web01 [address = "172.x.x.1"];
        web02 [address = "172.x.x.2"];
    }
}
```



```

db01;
db02;
}
}
@enduml

```



## 13.2 Define multiple addresses

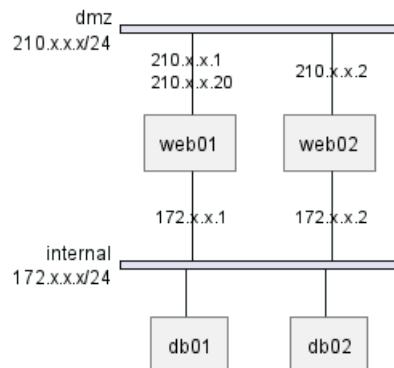
```

@startuml
nwdiag {
    network dmz {
        address = "210.x.x.x/24"

        // set multiple addresses (using comma)
        web01 [address = "210.x.x.1, 210.x.x.20"];
        web02 [address = "210.x.x.2"];
    }
    network internal {
        address = "172.x.x.x/24";

        web01 [address = "172.x.x.1"];
        web02 [address = "172.x.x.2"];
        db01;
        db02;
    }
}
@enduml

```



### 13.3 Grouping nodes

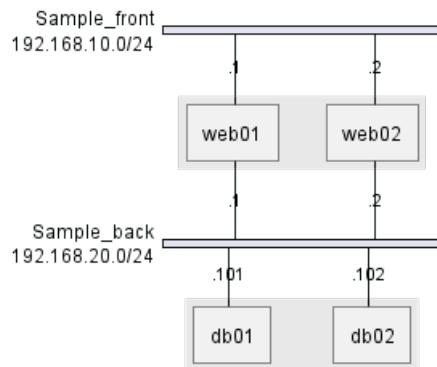
#### 13.3.1 Define group inside network definitions

```
@startuml
nwdiag {
    network Sample_front {
        address = "192.168.10.0/24";

        // define group
        group web {
            web01 [address = ".1"];
            web02 [address = ".2"];
        }
    }

    network Sample_back {
        address = "192.168.20.0/24";
        web01 [address = ".1"];
        web02 [address = ".2"];
        db01 [address = ".101"];
        db02 [address = ".102"];

        // define network using defined nodes
        group db {
            db01;
            db02;
        }
    }
}
@enduml
```



#### 13.3.2 Define group outside of network definitions

```
@startuml
nwdiag {
    // define group outside of network definitions
    group {
        color = "#FFAAAA";

        web01;
        web02;
        db01;
    }

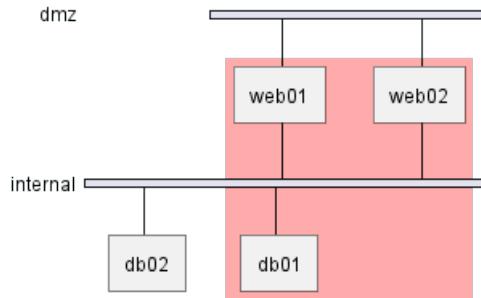
    network dmz {
```



```

web01;
web02;
}
network internal {
    web01;
    web02;
    db01;
    db02;
}
}
@enduml

```



### 13.3.3 Define several groups on same network

#### 13.3.4 Example with 2 group

```

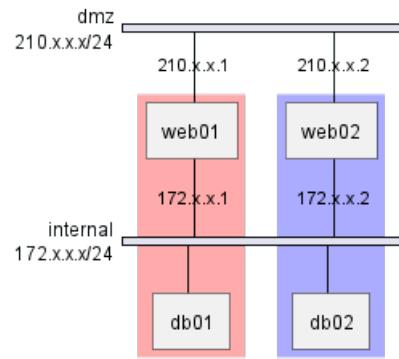
@startuml
nwdiag {
    group {
        color = "#FFaaaa";
        web01;
        db01;
    }
    group {
        color = "#aaaaFF";
        web02;
        db02;
    }
    network dmz {
        address = "210.x.x.x/24"

        web01 [address = "210.x.x.1"];
        web02 [address = "210.x.x.2"];
    }
    network internal {
        address = "172.x.x.x/24";

        web01 [address = "172.x.x.1"];
        web02 [address = "172.x.x.2"];
        db01 ;
        db02 ;
    }
}
@enduml

```





[Ref. QA-12663]

### 13.3.5 Example with 3 groups

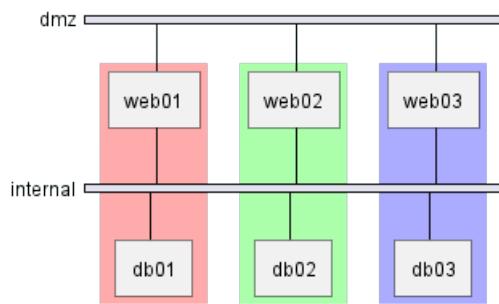
```

@startuml
nwdiag {
    group {
        color = "#FFaaaa";
        web01;
        db01;
    }
    group {
        color = "#aaFFaa";
        web02;
        db02;
    }
    group {
        color = "#aaaaFF";
        web03;
        db03;
    }

    network dmz {
        web01;
        web02;
        web03;
    }
    network internal {
        web01;
        db01 ;
        web02;
        db02 ;
        web03;
        db03;
    }
}
@enduml

```





[Ref. QA-13138]

## 13.4 Extended Syntax (for network or group)

### 13.4.1 Network

For network or network's component, you can add or change:

- addresses (*separated by comma ,*);
- color;
- description;
- shape.

```

@startuml
nwdiag {
    network Sample_front {
        address = "192.168.10.0/24"
        color = "red"

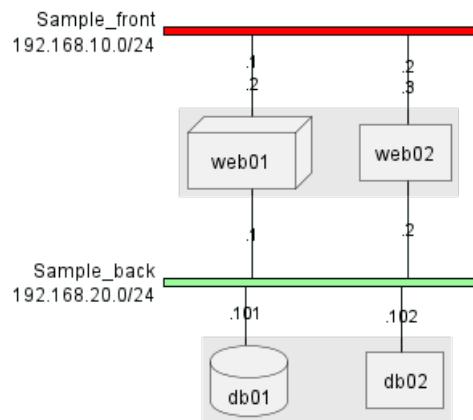
        // define group
        group web {
            web01 [address = ".1, .2", shape = "node"]
            web02 [address = ".2, .3"]
        }
    }

    network Sample_back {
        address = "192.168.20.0/24"
        color = "palegreen"
        web01 [address = ".1"]
        web02 [address = ".2"]
        db01 [address = ".101", shape = database ]
        db02 [address = ".102"]

        // define network using defined nodes
        group db {
            db01;
            db02;
        }
    }
}
@enduml

```





### 13.4.2 Group

For a group, you can add or change:

- color;
- description.

```

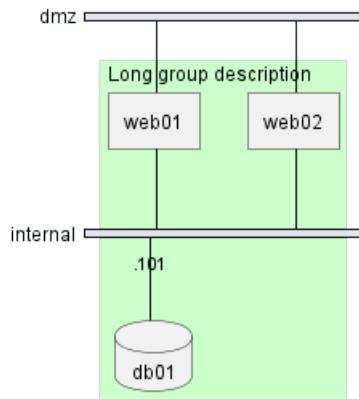
@startuml
nwdiag {
    group {
        color = "#CCFFCC";
        description = "Long group description";

        web01;
        web02;
        db01;
    }

    network dmz {
        web01;
        web02;
    }
    network internal {
        web01;
        web02;
        db01 [address = ".101", shape = database];
    }
}
@enduml

```





[Ref. QA-12056]

## 13.5 Using Sprites

You can use all sprites (icons) from the Standard Library or any other library.

Use the notation <\$sprite> to use a sprite, to make a new line, or any other Creole syntax.

```

@startuml
!include <office/Servers/application_server>
!include <office/Servers/database_server>

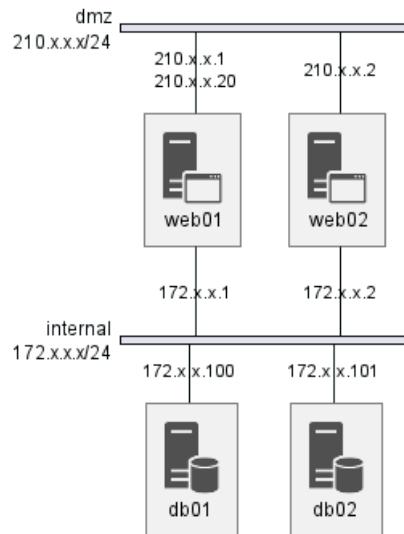
nwdiag {
    network dmz {
        address = "210.x.x.x/24"

        // set multiple addresses (using comma)
        web01 [address = "210.x.x.1, 210.x.x.20", description = "<$application_server>\n web01"]
        web02 [address = "210.x.x.2", description = "<$application_server>\n web02"];
    }
    network internal {
        address = "172.x.x.x/24";

        web01 [address = "172.x.x.1"];
        web02 [address = "172.x.x.2"];
        db01 [address = "172.x.x.100", description = "<$database_server>\n db01"];
        db02 [address = "172.x.x.101", description = "<$database_server>\n db02"];
    }
}
@enduml

```





[Ref. QA-11862]

## 13.6 Using OpenIconic

You can also use the icons from OpenIconic in network or node descriptions.

Use the notation <&icon> to make an icon, <&icon\*n> to multiply the size by a factor n, and \n to make a newline:

```
@startuml
```

```

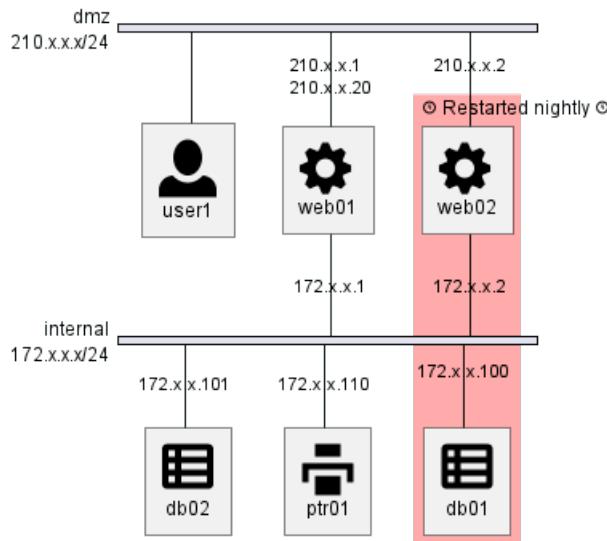
nwdiag {
    group nightly {
        color = "#FFAAAA";
        description = "<&clock> Restarted nightly <&clock>";
        web02;
        db01;
    }
    network dmz {
        address = "210.x.x.x/24"

        user [description = "<&person*4.5>\n user1"];
        // set multiple addresses (using comma)
        web01 [address = "210.x.x.1, 210.x.x.20", description = "<&cog*4>\nweb01"]
        web02 [address = "210.x.x.2", description = "<&cog*4>\nweb02"];

    }
    network internal {
        address = "172.x.x.x/24";

        web01 [address = "172.x.x.1"];
        web02 [address = "172.x.x.2"];
        db01 [address = "172.x.x.100", description = "<&spreadsheet*4>\n db01"];
        db02 [address = "172.x.x.101", description = "<&spreadsheet*4>\n db02"];
        ptr [address = "172.x.x.110", description = "<&print*4>\n ptr01"];
    }
}
@enduml
  
```





### 13.7 Same nodes on more than two networks

You can use same nodes on different networks (more than two networks); *nwdiag* use in this case '*jump line*' over networks.

```
@startuml
nwdiag {
    // define group at outside network definitions
    group {
        color = "#7777FF";

        web01;
        web02;
        db01;
    }

    network dmz {
        color = "pink"

        web01;
        web02;
    }

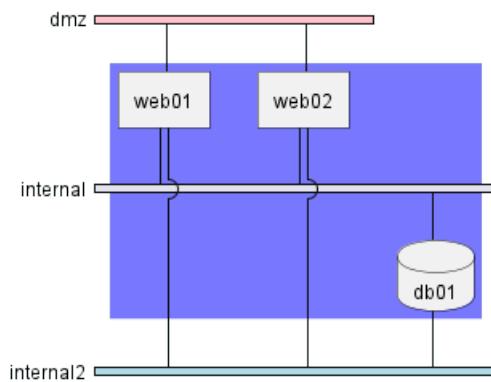
    network internal {
        web01;
        web02;
        db01 [shape = database ];
    }

    network internal2 {
        color = "LightBlue";

        web01;
        web02;
        db01;
    }
}
```



@enduml



## 13.8 Peer networks

Peer networks are simple connections between two nodes, for which we don't use a horizontal "busbar" network

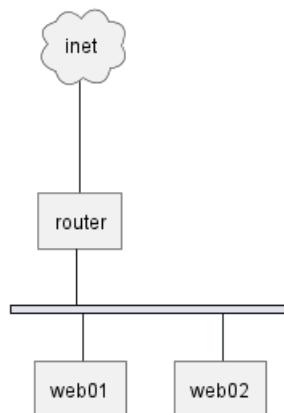
@startuml

```

nwdiag {
    inet [shape = cloud];
    inet -- router;

    network {
        router;
        web01;
        web02;
    }
}
@enduml

```



## 13.9 Peer networks and group

### 13.9.1 Without group

@startuml

```

nwdiag {
    internet [ shape = cloud];

```



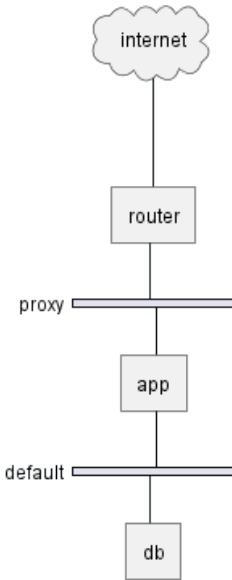
```

internet -- router;

network proxy {
    router;
    app;
}
network default {
    app;
    db;
}
}

@enduml

```



### 13.9.2 Group on first

```

@startuml
nwdiag {
    internet [ shape = cloud];
    internet -- router;

    group {
        color = "pink";
        app;
        db;
    }

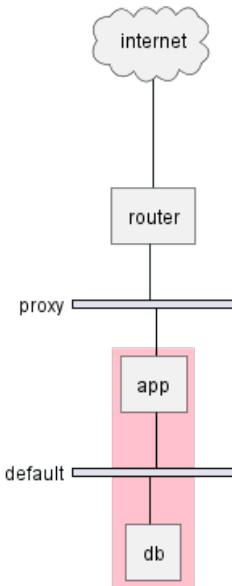
    network proxy {
        router;
        app;
    }

    network default {
        app;
        db;
    }
}

```



@enduml



### 13.9.3 Group on second

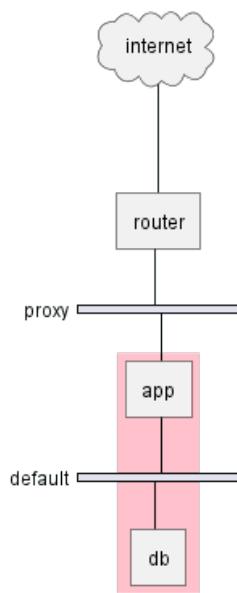
```
@startuml
nwdiag {
    internet [ shape = cloud];
    internet -- router;

    network proxy {
        router;
        app;
    }

    group {
        color = "pink";
        app;
        db;
    }

    network default {
        app;
        db;
    }
}
@enduml
```



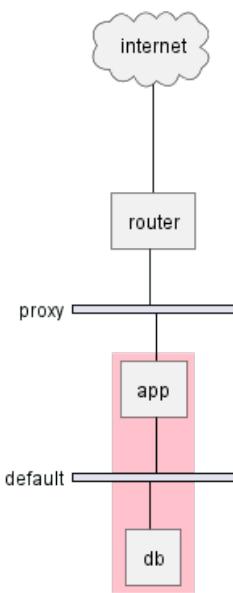


#### 13.9.4 Group on third

```
@startuml
nwdiag {
    internet [ shape = cloud];
    internet -- router;

    network proxy {
        router;
        app;
    }
    network default {
        app;
        db;
    }
    group {
        color = "pink";
        app;
        db;
    }
}
@enduml
```





[Ref. Issue#408 and QA-12655]

### 13.10 Add title, caption, header, footer or legend on network diagram

```
@startuml
```

```
header some header
```

```
footer some footer
```

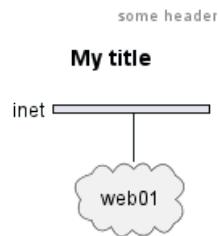
```
title My title
```

```
nwdiag {
    network inet {
        web01 [shape = cloud]
    }
}
```

```
legend
The legend
end legend
```

```
caption This is caption
@enduml
```





The legend

This is caption

some footer

[Ref. QA-11303 and Common commands]

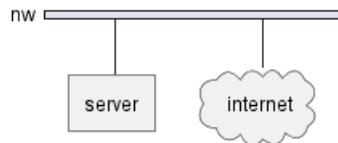
## 13.11 With or without shadow

### 13.11.1 With shadow (by default)

```

@startuml
nwdiag {
    network nw {
        server;
        internet;
    }
    internet [shape = cloud];
}
@enduml

```



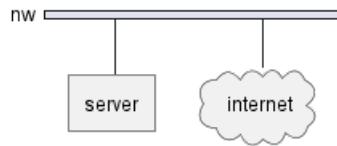
### 13.11.2 Without shadow

```

@startuml
<style>
root {
    shadowing 0
}
</style>
nwdiag {
    network nw {
        server;
        internet;
    }
    internet [shape = cloud];
}
@enduml

```





[Ref. QA-14516]

### 13.12 Change width of the networks

You can change the width of the networks, especially in order to have the same full width for only some or all networks.

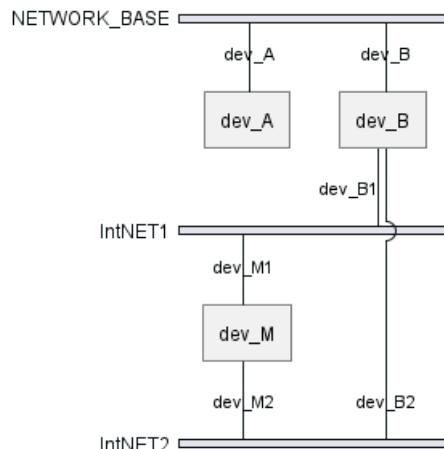
Here are some examples, with all the possibilities:

- without

```

@startuml
nwdiag {
    network NETWORK_BASE {
        dev_A [address = "dev_A" ]
        dev_B [address = "dev_B" ]
    }
    network IntNET1 {
        dev_B [address = "dev_B1" ]
        dev_M [address = "dev_M1" ]
    }
    network IntNET2 {
        dev_B [address = "dev_B2" ]
        dev_M [address = "dev_M2" ]
    }
}
@enduml

```



- only the first

```

@startuml
nwdiag {
    network NETWORK_BASE {
        width = full
        dev_A [address = "dev_A" ]
        dev_B [address = "dev_B" ]
    }
}

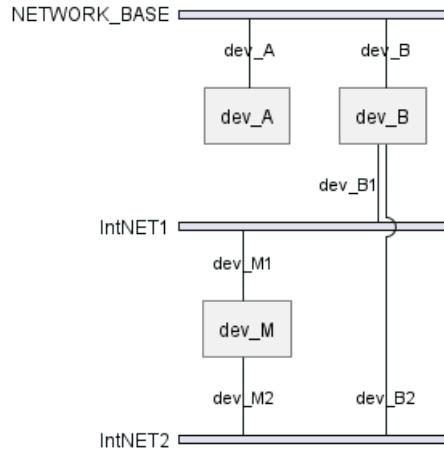
```



```

}
network IntNET1 {
    dev_B [address = "dev_B1" ]
    dev_M [address = "dev_M1" ]
}
network IntNET2 {
    dev_B [address = "dev_B2" ]
    dev_M [address = "dev_M2" ]
}
}
}
@enduml

```



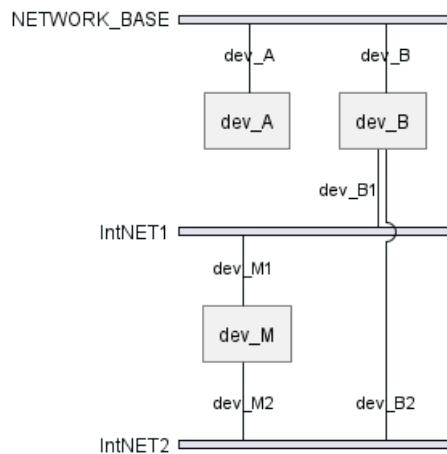
- the first and the second

```

@startuml
nwdiag {
    network NETWORK_BASE {
        width = full
        dev_A [address = "dev_A" ]
        dev_B [address = "dev_B" ]
    }
    network IntNET1 {
        width = full
        dev_B [address = "dev_B1" ]
        dev_M [address = "dev_M1" ]
    }
    network IntNET2 {
        dev_B [address = "dev_B2" ]
        dev_M [address = "dev_M2" ]
    }
}
}
@enduml

```



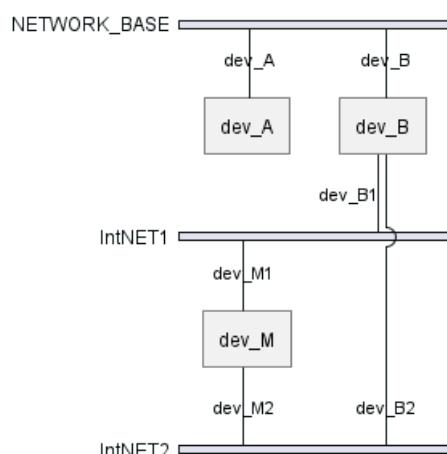


- all the network (with same full width)

```

@startuml
nwdiag {
    network NETWORK_BASE {
        width = full
        dev_A [address = "dev_A" ]
        dev_B [address = "dev_B" ]
    }
    network IntNET1 {
        width = full
        dev_B [address = "dev_B1" ]
        dev_M [address = "dev_M1" ]
    }
    network IntNET2 {
        width = full
        dev_B [address = "dev_B2" ]
        dev_M [address = "dev_M2" ]
    }
}
@enduml

```

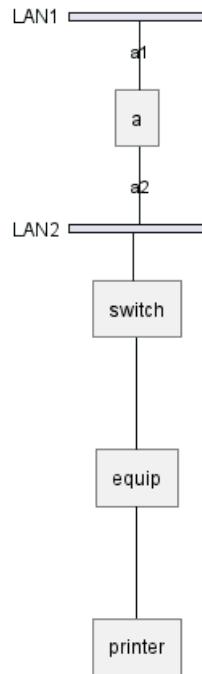


### 13.13 Other internal networks

You can define other internal networks (TCP/IP, USB, SERIAL,...).

- Without address or type

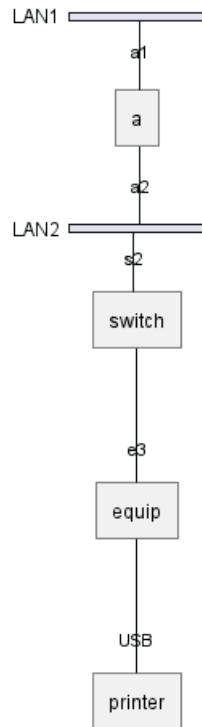
```
@startuml
nwdiag {
    network LAN1 {
        a [address = "a1"];
    }
    network LAN2 {
        a [address = "a2"];
        switch;
    }
    switch -- equip;
    equip -- printer;
}
@enduml
```



- With address or type

```
@startuml
nwdiag {
    network LAN1 {
        a [address = "a1"];
    }
    network LAN2 {
        a [address = "a2"];
        switch [address = "s2"];
    }
    switch -- equip;
    equip [address = "e3"];
    equip -- printer;
    printer [address = "USB"];
}
@enduml
```





[Ref. QA-12824]

## 13.14 Using (global) style

### 13.14.1 Without style (by default)

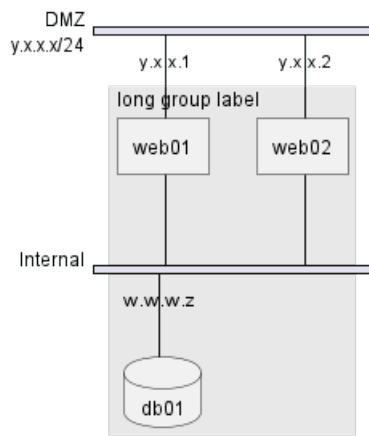
```

@startuml
nwdiag {
    network DMZ {
        address = "y.x.x.x/24"
        web01 [address = "y.x.x.1"];
        web02 [address = "y.x.x.2"];
    }

    network Internal {
        web01;
        web02;
        db01 [address = "w.w.w.z", shape = database];
    }

    group {
        description = "long group label";
        web01;
        web02;
        db01;
    }
}
@enduml
  
```





### 13.14.2 With style

You can use style to change rendering of elements.

```

@startuml
<style>
nwdiagDiagram {
    network {
        BackGroundColor green
        LineColor red
        LineThickness 1.0
        FontSize 18
        FontColor navy
    }
    server {
        BackGroundColor pink
        LineColor yellow
        LineThickness 1.0
        ' FontXXX only for description or label
        FontSize 18
        FontColor #blue
    }
    arrow {
        ' FontXXX only for address
        FontSize 17
        FontColor #red
        FontName Monospaced
        LineColor black
    }
    group {
        BackGroundColor cadetblue
        LineColor black
        LineThickness 2.0
        FontSize 11
        FontStyle bold
        Margin 5
        Padding 5
    }
}
</style>
nwdiag {

```



```

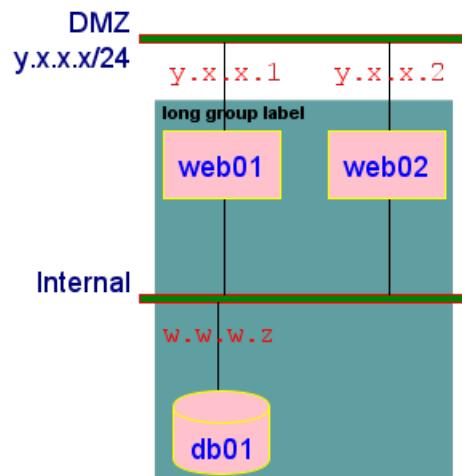
network DMZ {
    address = "y.x.x.x/24"
    web01 [address = "y.x.x.1"];
    web02 [address = "y.x.x.2"];
}

network Internal {
    web01;
    web02;
    db01 [address = "w.w.w.z", shape = database];
}

group {
    description = "long group label";
    web01;
    web02;
    db01;
}
}

@enduml

```



[Ref. QA-14479]

### 13.15 Appendix: Test of all shapes on Network diagram (nwdiag)

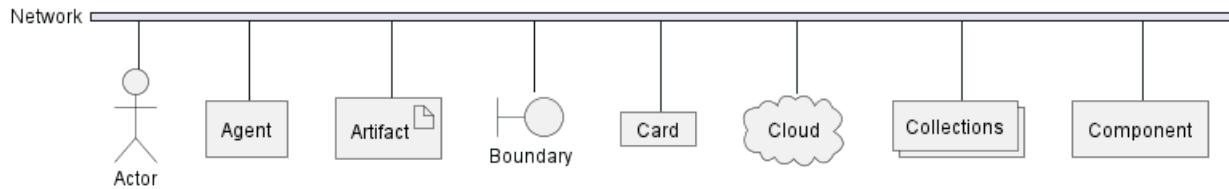
```

@startuml
nwdiag {
    network Network {
        Actor      [shape = actor]
        Agent      [shape = agent]
        Artifact   [shape = artifact]
        Boundary   [shape = boundary]
        Card       [shape = card]
        Cloud      [shape = cloud]
        Collections [shape = collections]
        Component   [shape = component]
    }
}
@enduml

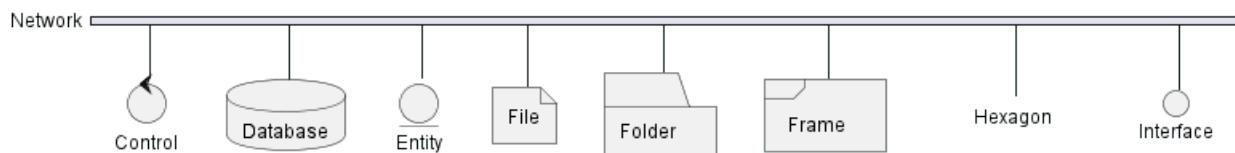
```



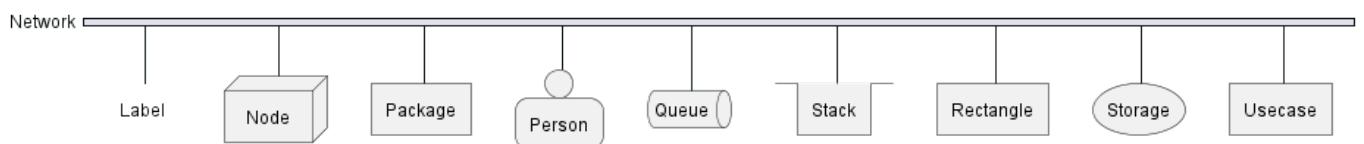
### 13.15 Appendix: Test of all shapes on Network diagram (nwdiag) NETWORK DIAGRAM (NWDIAG)



```
@startuml
nwdiag {
    network Network {
        Control      [shape = control]
        Database     [shape = database]
        Entity       [shape = entity]
        File         [shape = file]
        Folder       [shape = folder]
        Frame        [shape = frame]
        Hexagon      [shape = hexagon]
        Interface    [shape = interface]
    }
}
@enduml
```



```
@startuml
nwdiag {
    network Network {
        Label        [shape = label]
        Node         [shape = node]
        Package      [shape = package]
        Person       [shape = person]
        Queue        [shape = queue]
        Stack        [shape = stack]
        Rectangle    [shape = rectangle]
        Storage      [shape = storage]
        Usecase      [shape = usecase]
    }
}
@enduml
```

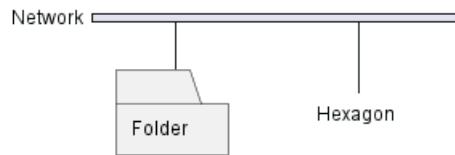


**TODO:** FIXME olli level 0 Overlap of label for folder olli level 0 Hexagon shape is missing olli ol

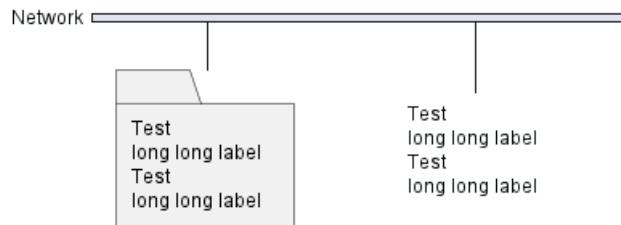


## 13.15 Appendix: Test of all shapes on Network diagram (nwdiag) NETWORK DIAGRAM (NWDIAG)

```
@startuml  
nwdiag {  
network Network {  
Folder [shape = folder]  
Hexagon [shape = hexagon]  
}  
}  
@enduml
```



```
@startuml  
nwdiag {  
network Network {  
Folder [shape = folder, description = "Test, long long label\\nTest, long long label"]  
Hexagon [shape = hexagon, description = "Test, long long label\\nTest, long long label"]  
}  
}  
@enduml
```



**TODO:** FIXME



## 14 Salt (Wireframe)

**Salt** is a subproject included in PlantUML that may help you to design graphical interface or *Website Wireframe or Page Schematic or Screen Blueprint*.

The goal of this tool is to discuss about simple and sample windows.

You can use either `@startsalt` keyword, or `@startuml` followed by a line with `salt` keyword.

### 14.1 Basic widgets

A window must start and end with brackets. You can then define:

- Button using [ and ].
- Radio button using ( and ).
- Checkbox using [ and ].
- User text area using ".
- Dropdown using ^.

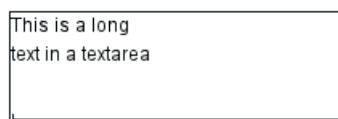
```
@startsalt
{
    Just plain text
    [This is my button]
    () Unchecked radio
    (X) Checked radio
    [] Unchecked box
    [X] Checked box
    "Enter text here"
    ^This is a dropdown^
}
@endsalt
```



### 14.2 Text area

Here is an attempt to create a text area:

```
@startsalt
{+
    This is a long
    text in a textarea
    .
    "
}
@endsalt
```



Note:



- the dot (.) to fill up vertical space;
- the last line of space (" ") to make the area wider.

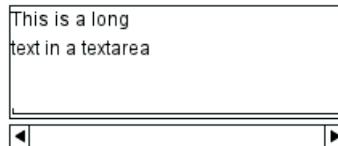
[Ref. QA-14765]

Then you can add scroll bar:

```
@startsalt
{SI
This is a long
text in a textarea
.
"
}
@endsalt
```



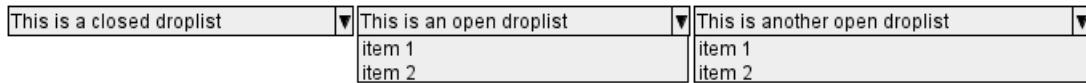
```
@startsalt
{S-
This is a long
text in a textarea
.
"
}
@endsalt
```



### 14.3 Open, close dropdown

You can open a dropdown, by adding values enclosed by ^, as:

```
@startsalt
{
^This is a closed dropdown^ |
^This is an open dropdown^^ item 1^^ item 2^ |
^This is another open dropdown^ item 1^ item 2^
}
@endsalt
```



[Ref. QA-4184]

### 14.4 Using grid [| and #, !, -, +]

A table is automatically created when you use an opening bracket {. And you have to use | to separate columns.

For example:

```
@startsalt
{
```



```

Login | "MyName"
Password | "****"
[Cancel] | [ OK ]
}
@endsalt

```

Login	<input type="text" value="MyName"/>
Password	<input type="password" value="****"/>
Cancel	OK

Just after the opening bracket, you can use a character to define if you want to draw lines or columns of the grid :

Symbol	Result
#	To display all vertical and horizontal lines
!	To display all vertical lines
-	To display all horizontal lines
+	To display external lines

```

@startsalt
{+
Login | "MyName"
Password | "****"
[Cancel] | [ OK ]
}
@endsalt

```

Login	<input type="text" value="MyName"/>
Password	<input type="password" value="****"/>
Cancel	OK

## 14.5 Group box [^]

```

@startsalt
{^"My group box"
Login | "MyName"
Password | "****"
[Cancel] | [ OK ]
}
@endsalt

```

<b>My group box</b>	
Login	<input type="text" value="MyName"/>
Password	<input type="password" value="****"/>
Cancel	OK

[Ref. QA-5840]

## 14.6 Using separator [.., ==, ~~, -]

You can use several horizontal lines as separator.

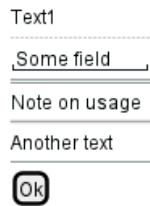
```

@startsalt
{
Text1
..
"Some field"
==
Note on usage
~~

```



```
Another text
--
[Ok]
}
@endsalt
```



## 14.7 Tree widget [T]

To have a Tree, you have to start with {T and to use + to denote hierarchy.

```
@startsalt
{
{T
+ World
++ America
+++ Canada
+++ USA
++++ New York
++++ Boston
+++ Mexico
++ Europe
+++ Italy
+++ Germany
++++ Berlin
++ Africa
}
}
@endsalt
```



## 14.8 Tree table [T]

You can combine trees with tables.

```
@startsalt
{
{T
+Region | Population | Age
+ World | 7.13 billion | 30
++ America | 964 million | 30
+++ Canada | 35 million | 30
+++ USA | 319 million | 30
++++ NYC | 8 million | 30
```



```

++++ Boston    | 617 thousand | 30
+++ Mexico    | 117 million  | 30
++ Europe     | 601 million  | 30
+++ Italy      | 61 million   | 30
+++ Germany    | 82 million   | 30
++++ Berlin    | 3 million    | 30
++ Africa     | 1 billion    | 30
}
}
@endsalt

```

Region	Population	Age
World	7.13 billion	30
America	964 million	30
Canada	35 million	30
USA	319 million	30
NYC	8 million	30
Boston	617 thousand	30
Mexico	117 million	30
Europe	601 million	30
Italy	61 million	30
Germany	82 million	30
Berlin	3 million	30
Africa	1 billion	30

And add lines.

```

@startsalt
{
..
== with T!
{T!
+Region      | Population    | Age
+ World      | 7.13 billion  | 30
++ America    | 964 million   | 30
}
..
== with T-
{T-
+Region      | Population    | Age
+ World      | 7.13 billion  | 30
++ America    | 964 million   | 30
}
..
== with T+
{T+
+Region      | Population    | Age
+ World      | 7.13 billion  | 30
++ America    | 964 million   | 30
}
..
== with T#
{T#
+Region      | Population    | Age
+ World      | 7.13 billion  | 30
++ America    | 964 million   | 30
}
}
}
@endsalt

```



with T!			
Region	Population	Age	
World	7.13 billion	30	
America	964 million	30	

with T-			
Region	Population	Age	
World	7.13 billion	30	
America	964 million	30	

with T+			
Region	Population	Age	
World	7.13 billion	30	
America	964 million	30	

with T#			
Region	Population	Age	
World	7.13 billion	30	
America	964 million	30	

[Ref. QA-1265]

## 14.9 Enclosing brackets [ , ]

You can define subelements by opening a new opening bracket.

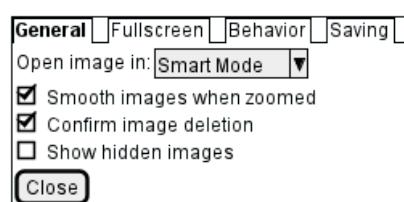
```
@startsalt
{
Name      | "
Modifiers: | { (X) public | () default | () private | () protected
           | [] abstract | [] final   | [] static }
Superclass: | { "java.lang.Object" | [Browse...]
}
@endsalt
```

Name	<input type="text"/>
Modifiers:	<input checked="" type="radio"/> public <input type="radio"/> default <input type="radio"/> private <input type="radio"/> protected <input type="checkbox"/> abstract <input type="checkbox"/> final <input type="checkbox"/> static
Superclass:	<input type="text"/> <a href="#">Browse...</a>

## 14.10 Adding tabs [/]

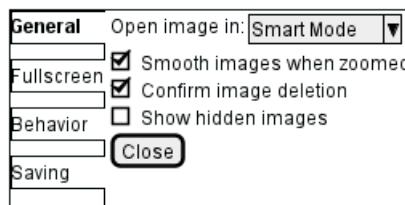
You can add tabs using{/ notation. Note that you can use HTML code to have bold text.

```
@startsalt
{+
{/ <b>General | Fullscreen | Behavior | Saving >
{
{ Open image in: | ^Smart Mode^ }
[X] Smooth images when zoomed
[X] Confirm image deletion
[ ] Show hidden images
}
[Close]
}
@endsalt
```



Tab could also be vertically oriented:

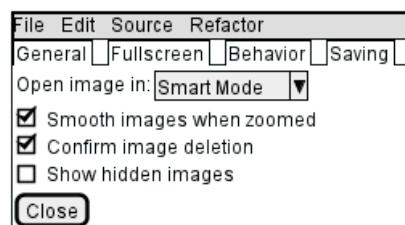
```
@startsalt
{+
{/ <b>General
Fullscreen
Behavior
Saving } |
{
{ Open image in: | ^Smart Mode^ }
[X] Smooth images when zoomed
[X] Confirm image deletion
[ ] Show hidden images
[Close]
}
}
@endsalt
```



## 14.11 Using menu [\*]

You can add a menu by using {\*} notation.

```
@startsalt
{+
{* File | Edit | Source | Refactor }
{/ General | Fullscreen | Behavior | Saving }
{
{ Open image in: | ^Smart Mode^ }
[X] Smooth images when zoomed
[X] Confirm image deletion
[ ] Show hidden images
}
[Close]
}
@endsalt
```

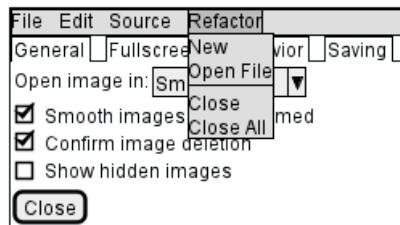


It is also possible to open a menu:

```
@startsalt
{+
{* File | Edit | Source | Refactor
Refactor | New | Open File | - | Close | Close All }
{/ General | Fullscreen | Behavior | Saving }
{
{ Open image in: | ^Smart Mode^ }
```

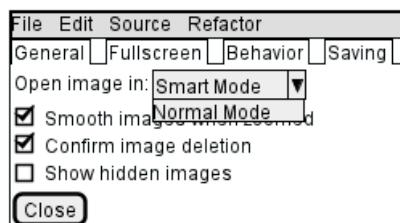


```
[X] Smooth images when zoomed
[X] Confirm image deletion
[ ] Show hidden images
}
[Close]
}
@endsalt
```



Like it is possible to open a droplist:

```
@startsalt
{+
{* File | Edit | Source | Refactor }
{/ General | Fullscreen | Behavior | Saving }
{
{ Open image in: | ^Smart Mode^~Normal Mode^ }
[X] Smooth images when zoomed
[X] Confirm image deletion
[ ] Show hidden images
}
[Close]
}
@endsalt
```



[Ref. QA-4184]

## 14.12 Advanced table

You can use two special notations for table :

- \* to indicate that a cell with span with left
- . to denote an empty cell

```
@startsalt
{#
. | Column 2 | Column 3
Row header 1 | value 1 | value 2
Row header 2 | A long cell | *
}
@endsalt
```

	Column 2	Column 3
Row header 1	value 1	value 2
Row header 2	A long cell	*

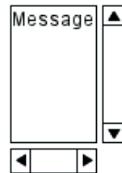


### 14.13 Scroll Bars [S, SI, S-]

You can use {S notation for scroll bar like in following examples:

- {S: for horizontal and vertical scrollbars

```
@startsalt
{S
Message
.
.
.
}
@endsalt
```



- {SI : for vertical scrollbar only

```
@startsalt
{SI
Message
.
.
.
}
@endsalt
```



- {S- : for horizontal scrollbar only

```
@startsalt
{S-
Message
.
.
.
}
@endsalt
```



### 14.14 Colors

It is possible to change text color of widget.



```
@startsalt
{
<color:Blue>Just plain text
[This is my default button]
[<color:green>This is my green button]
[<color:#9a9a9a>This is my disabled button]
[] <color:red>Unchecked box
[X] <color:green>Checked box
"Enter text here"
~This is a dropdown^
~<color:#9a9a9a>This is a disabled dropdown^
~<color:red>This is a red dropdown^
}
@endsalt
```



[Ref. QA-12177]

## 14.15 Creole on Salt

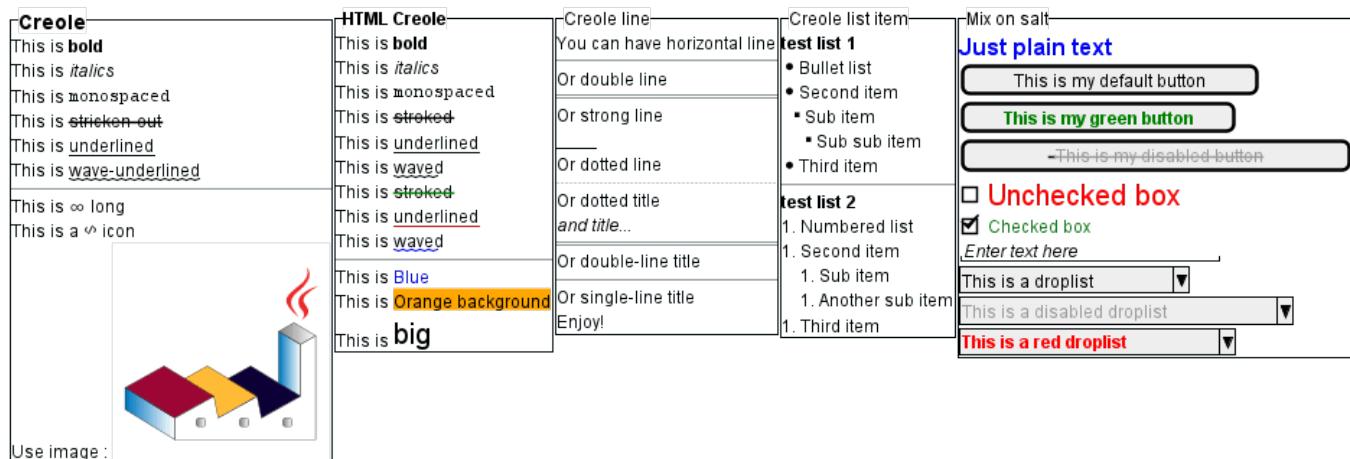
You can use Creole or HTML Creole on salt:

```
@startsalt
{{^==Creole
This is **bold**
This is //italics//
This is ""monospaced"""
This is --stricken-out--
This is __underlined__
This is ~~wave-underlined~~
--test Unicode and icons--
This is <U+221E> long
This is a <&code> icon
Use image : <img:http://plantuml.com/logo3.png>
}|
{^<b>HTML Creole
This is <b>bold</b>
This is <i>italics</i>
This is <font:monospaced>monospaced</font>
This is <s>stroked</s>
This is <u>underlined</u>
This is <w>waved</w>
This is <s:green>stroked</s>
This is <u:red>underlined</u>
This is <w:#0000FF>waved</w>
-- other examples --
This is <color:blue>Blue</color>
This is <back:orange>Orange background</back>
This is <size:20>big</size>
```



```
}|
{^Creole line
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
Or dotted title
//and title... //
==Title==
Or double-line title
--Another title--
Or single-line title
Enjoy!
}|
{^Creole list item
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
}|
{^Mix on salt
==<color:Blue>Just plain text
[This is my default button]
[<b><color:green>This is my green button]
[ ---<color:#9a9a9a>This is my disabled button-- ]
[] <size:20><color:red>Unchecked box
[X] <color:green>Checked box
"/Enter text here//"
~This is a dropdown~
^<color:#9a9a9a>This is a disabled dropdown^
~<b><color:red>This is a red dropdown^
}}
@endsalt
```





## 14.16 Pseudo sprite [«, »]

Using << and >> you can define a pseudo-sprite or sprite-like drawing and reusing it latter.

```
@startsalt
{
[X] checkbox | [] checkbox
() radio | (X) radio
This is a text | [This is my button] | This is another text
"A field" | "Another long Field" | [A button]
<<folder
.....
.XXXXXX.....
.X...X.....
.XXXXXXXXXXX.
.X.....X.
.X.....X.
.X.....X.
.X.....X.
.X.....X.
.XXXXXXXXXXX.
.....
>>|<color:blue>other folder|<<folder>>
^Dropelist^
}
@endsalt
```



[Ref. QA-5849]

## 14.17 OpenIconic

OpenIconic is a very nice open source icon set. Those icons have been integrated into the creole parser, so you can use them out-of-the-box. You can use the following syntax: <&ICON\_NAME>.

```
@startsalt
{
Login<&person> | "MyName" "
Password<&key> | "****" "
```



```
[Cancel <&circle-x>] | [OK <&account-login>]
}
@endsalt
```

Login MyName  
 Password \*\*\*\*  
 Cancel OK

The complete list is available on OpenIconic Website, or you can use the following special diagram:

```
@startuml
listopeniconic
@enduml
```

<b>List Open Iconic</b>						
Credit to						
<a href="https://useiconic.com/open">https://useiconic.com/open</a>						

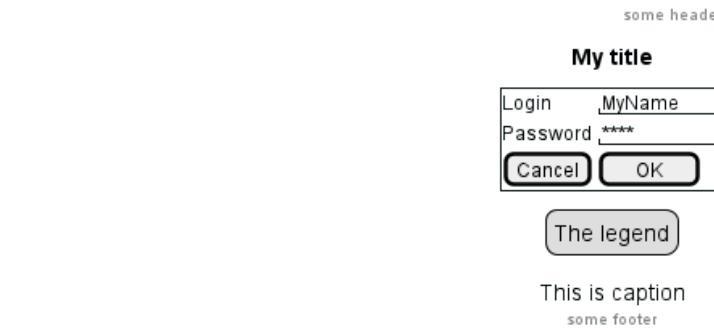
## 14.18 Add title, header, footer, caption or legend

```
@startsalt
title My title
header some header
footer some footer
caption This is caption
legend
The legend
end legend
```

```
{+
  Login | "MyName"
  Password | "****"
  [Cancel] | [ OK ]
}
```

```
@endsalt
```



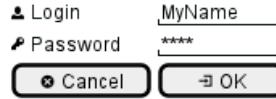


(See also: Common commands)

## 14.19 Zoom, DPI

### 14.19.1 Whitout zoom (by default)

```
@startsalt
{
    <&person> Login | "MyName"
    <&key> Password | "****"
    [<&circle-x> Cancel] | [<&account-login> OK]
}
@endsalt
```



### 14.19.2 Scale

You can use the `scale` command to zoom the generated image.

You can use either a number or a fraction to define the scale factor. You can also specify either width or height (in pixel). And you can also give both width and height: the image is scaled to fit inside the specified dimension.

```
@startsalt
scale 2
{
    <&person> Login | "MyName"
    <&key> Password | "****"
    [<&circle-x> Cancel] | [<&account-login> OK]
}
@endsalt
```



(See also: Zoom on Common commands)

### 14.19.3 DPI

You can also use the `skinparam dpi` command to zoom the generated image.

```
@startsalt
```



```

skinparam dpi 200
{
    <&person> Login | "MyName"
    <&key> Password | "*****"
    [<&circle-x> Cancel] | [ <&account-login> OK ]
}
@endsalt

```



## 14.20 Include Salt "on activity diagram"

You can read the following explanation.

```

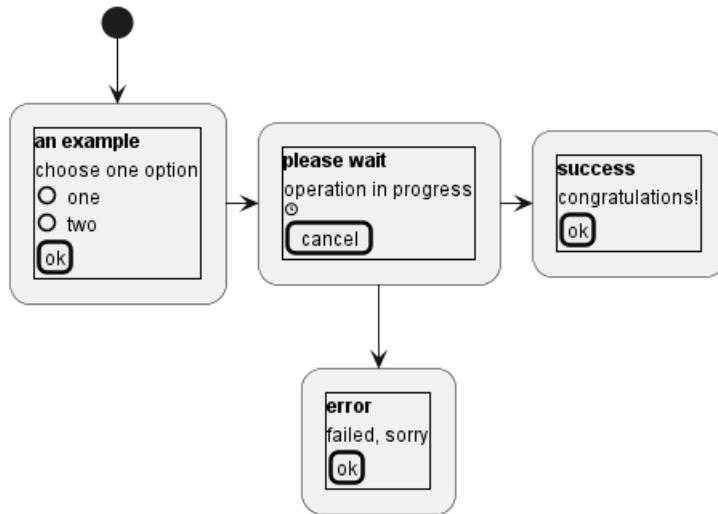
@startuml
(*) --> "
{{{
salt
{+
<b>an example
choose one option
()one
()two
[ok]
}
}}
" as choose

choose -right-> "
{{{
salt
{+
<b>please wait
operation in progress
<&clock>
[cancel]
}
}}
" as wait
wait -right-> "
{{{
salt
{+
<b>success
congratulations!
[ok]
}
}}
" as success

wait -down-> "
{{{
salt
}}
```



```
{
<b>error
failed, sorry
[ok]
}
}
"
@enduml
```



It can also be combined with define macro.

```
@startuml
!unquoted procedure SALT($x)
"{
salt
%invoke_procedure("_"+$x)
}" as $x
!endprocedure

!procedure _choose()
{+
<b>an example
choose one option
()one
()two
[ok]
}
!endprocedure

!procedure _wait()
{+
<b>please wait
operation in progress
<&clock>
[cancel]
}
!endprocedure

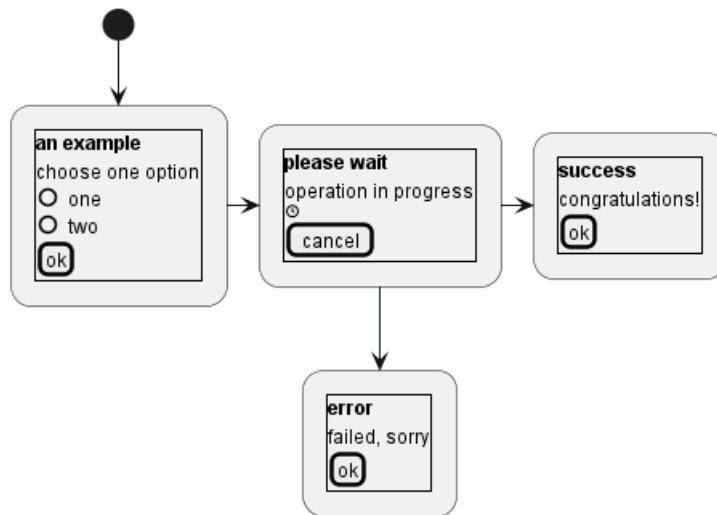
!procedure _success()
{+
<b>success
congratulations!
}
```



```
[ok]
}
!endprocedure

!procedure _error()
{+
<b>error
failed, sorry
[ok]
}
!endprocedure

(*) --> SALT(choose)
-right-> SALT(wait)
wait -right-> SALT(success)
wait -down-> SALT(error)
@enduml
```

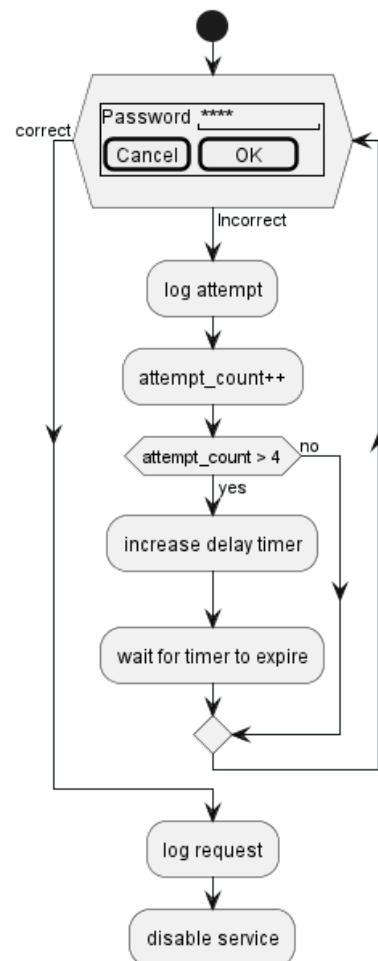


## 14.21 Include salt "on while condition of activity diagram"

You can include salt on while condition of activity diagram.

```
@startuml
start
while (\n{\n\lsalt\n{+\nPassword | "****" "\n[Cancel] | [ OK ]}\n}) is (Incorrect)
:log attempt;
:attempt_count++;
if (attempt_count > 4) then (yes)
:increase delay timer;
:wait for timer to expire;
else (no)
endif
endwhile (correct)
:log request;
:disable service;
@enduml
```





[Ref. QA-8547]

## 14.22 Include salt "on repeat while condition of activity diagram"

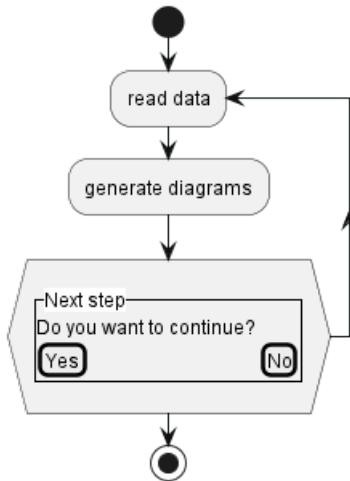
You can include salt on 'repeat while' condition of activity diagram.

```

@startuml
start
repeat :read data;
    :generate diagrams;
repeat while (\n{\nsalt\n{"Next step"\n  Do you want to continue? \n[Yes] | [No]\n}}\n)
stop
@enduml

```





[Ref. QA-14287]

### 14.23 Skinparam

You can use [only] some skinparam command to change the skin of the drawing.

Some example:

```
@startsalt
skinparam Backgroundcolor palegreen
{+
  Login | "MyName"
  Password | "****"
  [Cancel] | [ OK ]
}
@endsalt
```



```
@startsalt
skinparam handwritten true
{+
  Login | "MyName"
  Password | "****"
  [Cancel] | [ OK ]
}
@endsalt
```



**TODO: FIXME** FYI, some other skinparam does not work with salt, as:

```
@startsalt
skinparam defaultFontName monospaced
{+
  Login | "MyName"
  Password | "****"
  [Cancel] | [ OK ]
}
@endsalt
```





## 14.24 Style

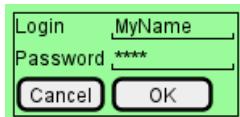
You can use [only] some style command to change the skin of the drawing.

Some example:

```

@startsalt
<style>
saltDiagram {
    BackgroundColor palegreen
}
</style>
{+
    Login | "MyName"
    Password | "****"
    [Cancel] | [ OK ]
}
@endsalt

```



**TODO: FIXME** FYI, some other style does not work with salt, as:

```

@startsalt
<style>
saltDiagram {
    Fontname Monospaced
    FontSize 10
    FontStyle italic
    LineThickness 0.5
    LineColor red
}
</style>
{+
    Login | "MyName"
    Password | "****"
    [Cancel] | [ OK ]
}
@endsalt

```



[Ref. QA-13460]



## 15 Archimate Diagram

This is only a proposal and subject to change.

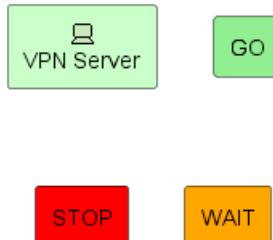
You are very welcome to create a new discussion on this future syntax. Your feedbacks, ideas and suggestions help us to find the right solution.

### 15.1 Archimate keyword

You can use the `archimate` keyword to define an element. Stereotype can optionally specify an additional icon. Some colors (Business, Application, Motivation, Strategy, Technology, Physical, Implementation) are also available.

```
@startuml
archimate #Technology "VPN Server" as vpnServerA <<technology-device>>

rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange
@enduml
```



### 15.2 Defining Junctions

Using the `circle` keyword and the preprocessor, you can also create junctions.

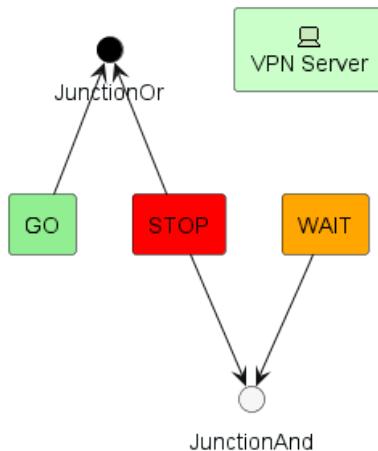
```
@startuml
!define Junction_Or circle #black
!define Junction_And circle #whitesmoke

Junction_And JunctionAnd
Junction_Or JunctionOr

archimate #Technology "VPN Server" as vpnServerA <<technology-device>>

rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange
GO -up-> JunctionOr
STOP -up-> JunctionOr
STOP -down-> JunctionAnd
WAIT -down-> JunctionAnd
@enduml
```





### 15.3 Example 1

```

@startuml
skinparam rectangle<<behavior>> {
roundCorner 25
}
sprite $bProcess jar:archimate/business-process
sprite $aService jar:archimate/application-service
sprite $aComponent jar:archimate/application-component

rectangle "Handle claim" as HC <<$bProcess>><<behavior>> #Business
rectangle "Capture Information" as CI <<$bProcess>><<behavior>> #Business
rectangle "Notify\nAdditional Stakeholders" as NAS <<$bProcess>><<behavior>> #Business
rectangle "Validate" as V <<$bProcess>><<behavior>> #Business
rectangle "Investigate" as I <<$bProcess>><<behavior>> #Business
rectangle "Pay" as P <<$bProcess>><<behavior>> #Business

HC *--down- CI
HC *--down- NAS
HC *--down- V
HC *--down- I
HC *--down- P

CI -right->> NAS
NAS -right->> V
V -right->> I
I -right->> P

rectangle "Scanning" as scanning <<$aService>><<behavior>> #Application
rectangle "Customer admnistration" as customerAdministration <<$aService>><<behavior>> #Application
rectangle "Claims admnistration" as claimsAdministration <<$aService>><<behavior>> #Application
rectangle Printing <<$aService>><<behavior>> #Application
rectangle Payment <<$aService>><<behavior>> #Application

scanning -up-> CI
customerAdministration -up-> CI
claimsAdministration -up-> NAS
claimsAdministration -up-> V
claimsAdministration -up-> I
Payment -up-> P

Printing -up-> V
Printing -up-> P

```

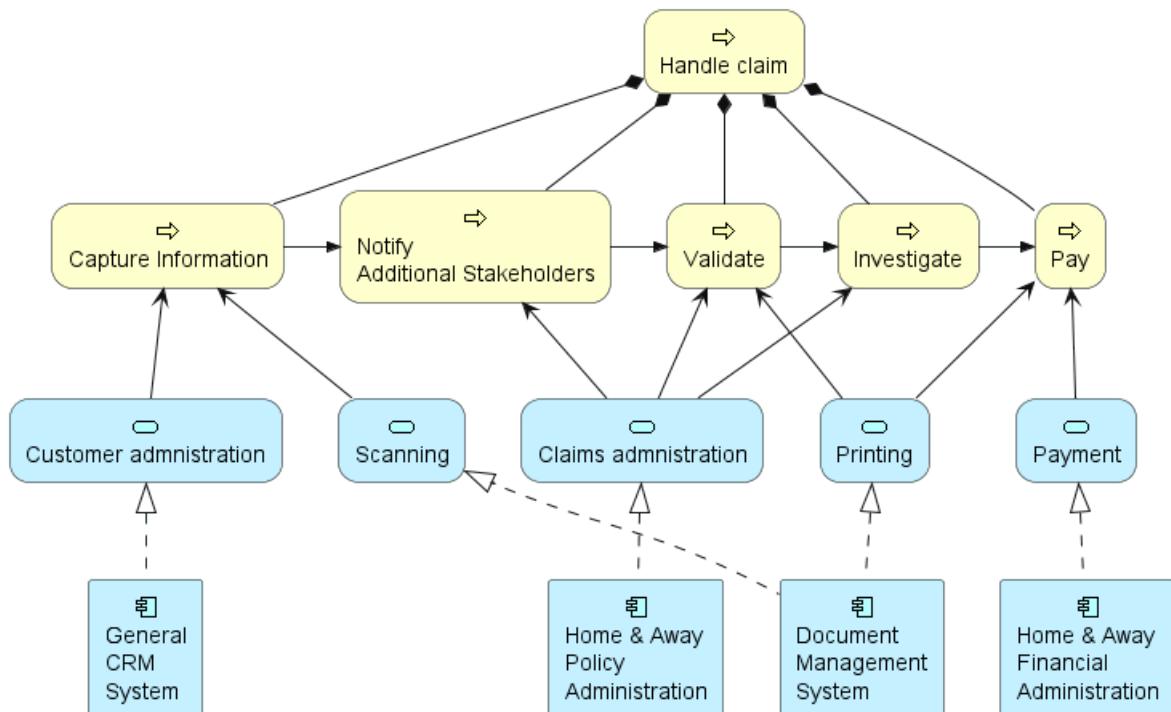
```

rectangle "Document\Management\System" as DMS <<$aComponent>> #Application
rectangle "General\CRM\System" as CRM <<$aComponent>> #Application
rectangle "Home & Away\Policy\Administration" as HAPA <<$aComponent>> #Application
rectangle "Home & Away\Financial\Administration" as HFPA <<$aComponent>> #Application

DMS .up.|> scanning
DMS .up.|> Printing
CRM .up.|> customerAdministration
HAPA .up.|> claimsAdministration
HFPA .up.|> Payment

legend left
Example from the "Archisurance case study" (OpenGroup).
See
=====
<$bProcess> :business process
=====
<$aService> : application service
=====
<$aComponent> : application component
endlegend
@enduml

```

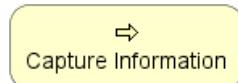


Example from the "Archisurance case study" (OpenGroup).
See
⇒ :business process
⊐ : application service
⊑ : application component

## 15.4 Example 2

@startuml

```
skinparam roundcorner 25
rectangle "Capture Information" as CI <<$archimate/business-process>> #Business
@enduml
```



## 15.5 List possible sprites

You can list all possible sprites for Archimate using the following diagram:

```
@startuml
listsprite
@enduml
```



## 15.6 ArchiMate Macros

### 15.6.1 Archimate Macros and Library

A list of Archimate macros are defined Archimate-PlantUML here which simplifies the creation of ArchiMate diagrams, and Archimate is natively on the Standard Library of PlantUML.

### 15.6.2 Archimate elements

Using the macros, creation of ArchiMate elements are done using the following format: `Category_ElementName(nameOfThe "description")`

For example:

- To define a *Stakeholder* element, which is part of Motivation category, the syntax will be `Motivation_Stakeholder("Stakeholder Description")`:



```
@startuml
!include <archimate/Archimate>
Motivation_Stakeholder(StakeholderElement, "Stakeholder Description")
@enduml
```



- To define a *Business Service* element, `Business_Service(BService, "Business Service")`:

```
@startuml
!include <archimate/Archimate>
Business_Service(BService, "Business Service")
@enduml
```



### 15.6.3 Archimate relationships

The ArchiMate relationships are defined with the following pattern: `Rel_RelationType(fromElement, toElement, "description")` and to define the direction/orientation of the two elements: `Rel_RelationType_Direction toElement, "description")`

The `RelationTypes` supported are:

- Access
- Aggregation
- Assignment
- Association
- Composition
- Flow
- Influence
- Realization
- Serving
- Specialization
- Triggering

The `Directions` supported are:

- Up
- Down
- Left
- Right

For example:

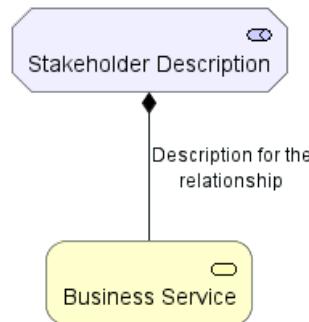
- To denote a composition relationship between the *Stakeholder* and *Business Service* defined above, the syntax will be

```
Rel_Composition(StakeholderElement, BService, "Description for the relationship")
```

```
@startuml
!include <archimate/Archimate>
Motivation_Stakeholder(StakeholderElement, "Stakeholder Description")
```



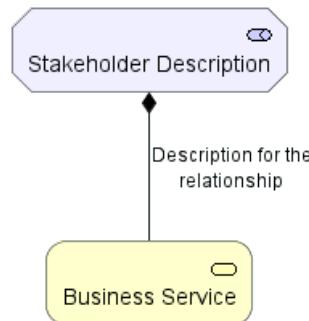
```
Business_Service(BService, "Business Service")
Rel_Composition(StakeholderElement, BService, "Description for the relationship")
@enduml
```



- Unordered List Item To orient the two elements in top - down position, the syntax will be

```
Rel_Composition_Down(StakeholderElement, BService, "Description for the relationship")

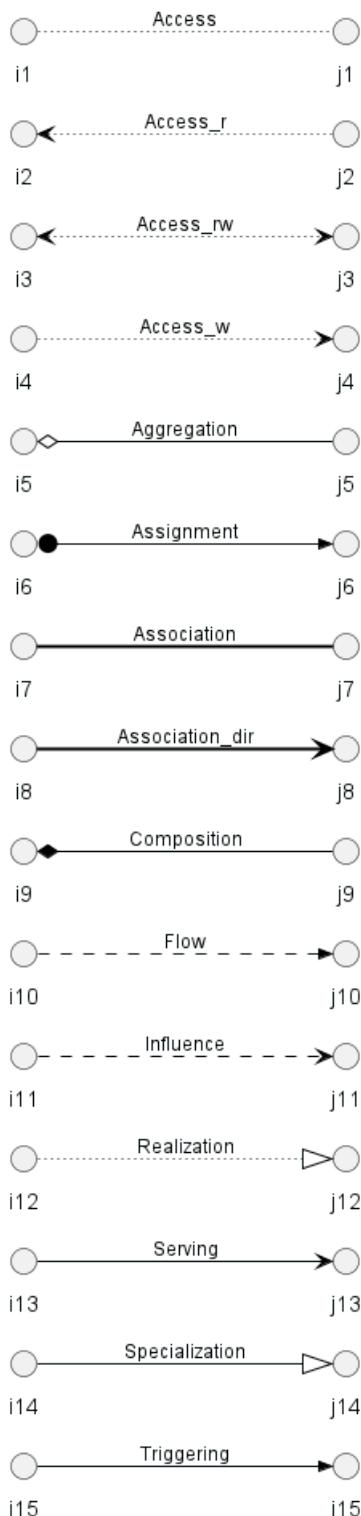
@startuml
!include <archimate/Archimate>
Motivation_Stakeholder(StakeholderElement, "Stakeholder Description")
Business_Service(BService, "Business Service")
Rel_Composition_Down(StakeholderElement, BService, "Description for the relationship")
@enduml
```



#### 15.6.4 Appendix: Examples of all Archimate RelationTypes

```
@startuml
left to right direction
skinparam nodesep 4
!include <archimate/Archimate>
Rel_Triggering(i15, j15, Triggering)
Rel_Specialization(i14, j14, Specialization)
Rel_Serving(i13, j13, Serving)
Rel_Realization(i12, j12, Realization)
Rel_Influence(i11, j11, Influence)
Rel_Flow(i10, j10, Flow)
Rel_Composition(i9, j9, Composition)
Rel_Association_dir(i8, j8, Association_dir)
Rel_Association(i7, j7, Association)
Rel_Assignment(i6, j6, Assignment)
Rel_Aggregation(i5, j5, Aggregation)
Rel_Access_w(i4, j4, Access_w)
Rel_Access_rw(i3, j3, Access_rw)
Rel_Access_r(i2, j2, Access_r)
Rel_Access(i1, j1, Access)
@enduml
```





```
@startuml
title ArchiMate Relationships Overview
skinparam nodesep 5
<style>
interface {
    shadowing 0
    backgroundcolor transparent
    linecolor transparent
    FontColor transparent
}
```



```

}

</style>
!include <archimate/Archimate>
left to right direction

rectangle Other {
() i14
() j14
}

rectangle Dynamic {
() i10
() j10
() i15
() j15
}

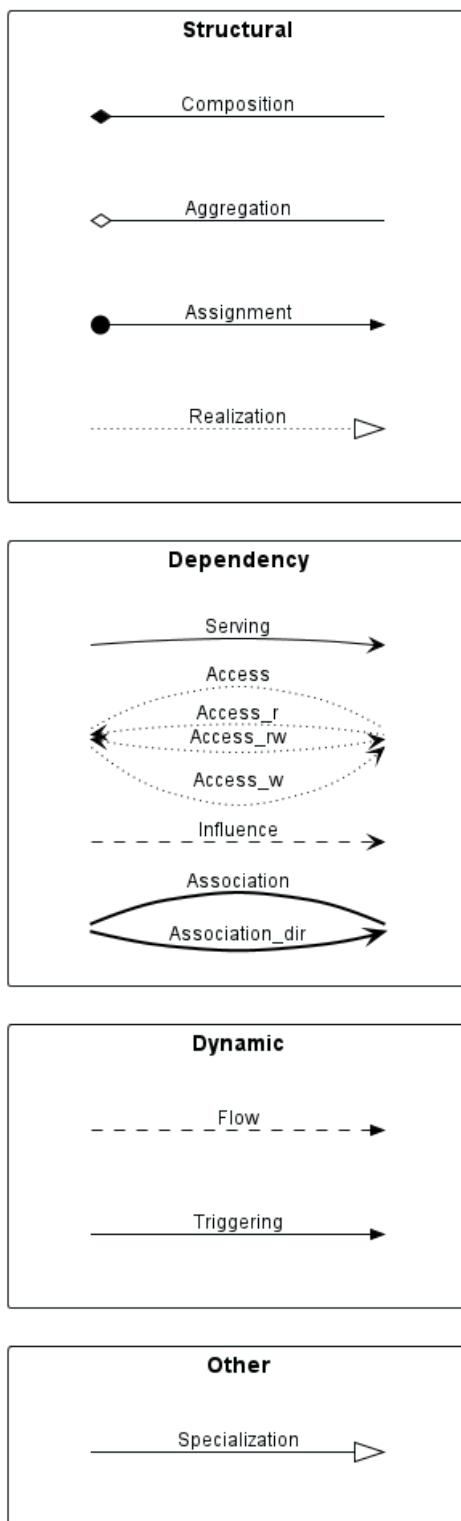
rectangle Dependency {
() i13
() j13
() i4
() j4
() i11
() j11
() i7
() j7
}

rectangle Structural {
() i9
() j9
() i5
() j5
() i6
() j6
() i12
() j12
}

Rel_Triggering(i15, j15, Triggering)
Rel_Specialization(i14, j14, Specialization)
Rel_Serving(i13, j13, Serving)
Rel_Realization(i12, j12, Realization)
Rel_Influence(i11, j11, Influence)
Rel_Flow(i10, j10, Flow)
Rel_Composition(i9, j9, Composition)
Rel_Association_dir(i7, j7, \nAssociation_dir)
Rel_Association(i7, j7, Association)
Rel_Assignment(i6, j6, Assignment)
Rel_Aggregation(i5, j5, Aggregation)
Rel_Access_w(i4, j4, Access_w)
Rel_Access_rw(i4, j4, Access_rw)
Rel_Access_r(i4, j4, Access_r)
Rel_Access(i4, j4, Access)
@enduml

```



**ArchiMate Relationships Overview**

[Adapted from Archimate PR#25]



# 16 Gantt Diagram

The Gantt is described in *natural* language, using very simple sentences (subject-verb-complement).

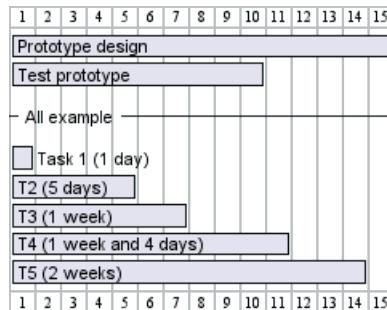
## 16.1 Declaring tasks

Tasks defined using square bracket.

### 16.1.1 Duration

Their durations are defined using the `lasts` verb:

```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
-- All example --
[Task 1 (1 day)] lasts 1 day
[T2 (5 days)] lasts 5 days
[T3 (1 week)] lasts 1 week
[T4 (1 week and 4 days)] lasts 1 week and 4 days
[T5 (2 weeks)] lasts 2 weeks
@endgantt
```



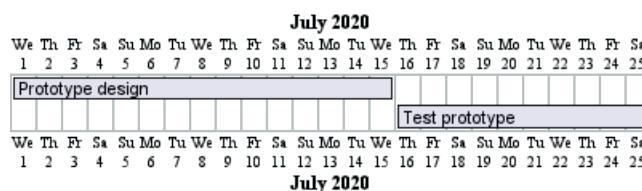
A week is a synonym for how many non-closed days are in a week. So if you specify Saturday and Sunday as closed, a week will be equivalent to 5 days

### 16.1.2 Start

Their beginning are defined using the `start` verb:

```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
```

```
Project starts 2020-07-01
[Prototype design] starts 2020-07-01
[Test prototype] starts 2020-07-16
@endgantt
```

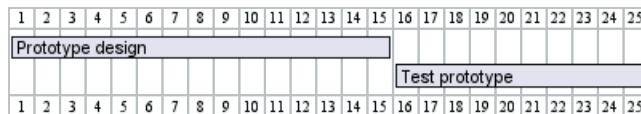


```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
```

```
[Prototype design] starts D+0
```



[Test prototype] starts D+15  
 @endgantt



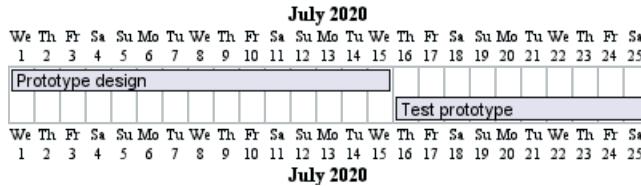
[Ref. for D+nn form: QA-14494]

### 16.1.3 End

Their endings are defined using the end verb:

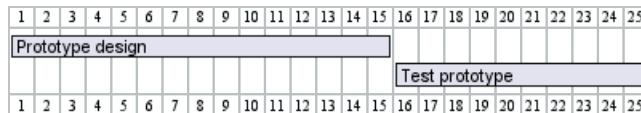
```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
```

Project starts 2020-07-01  
 [Prototype design] ends 2020-07-15  
 [Test prototype] ends 2020-07-25  
 @endgantt



```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
```

[Prototype design] ends D+14  
 [Test prototype] ends D+24  
 @endgantt

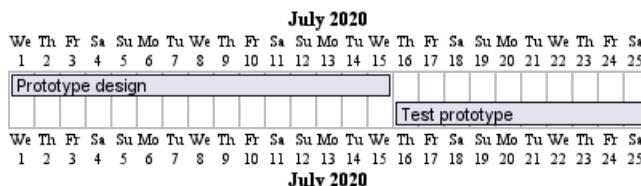


### 16.1.4 Start/End

It is possible to define both absolutely, by specifying dates:

```
@startgantt
Project starts 2020-07-01
[Prototype design] starts 2020-07-01
[Test prototype] starts 2020-07-16
[Prototype design] ends 2020-07-15
[Test prototype] ends 2020-07-25
```

@endgantt



@startgantt

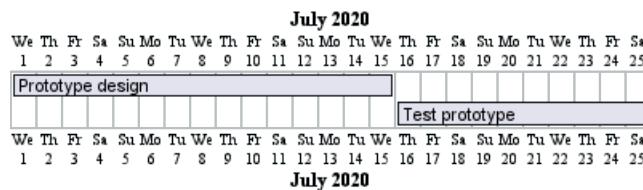
```
[Prototype design] starts D+0
[Test prototype] starts D+15
[Prototype design] ends D+14
[Test prototype] ends D+24
@endgantt
```



## 16.2 One-line declaration (with the and conjunction)

It is possible to combine declaration on one line with the `and` conjunction.

```
@startgantt
Project starts 2020-07-01
[Prototype design] starts 2020-07-01 and ends 2020-07-15
[Test prototype] starts 2020-07-16 and lasts 10 days
@endgantt
```



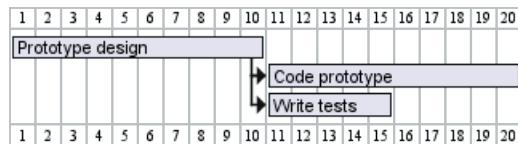
## 16.3 Adding constraints

It is possible to add constraints between tasks.

```
@startgantt
[Prototype design] lasts 15 days
[Test prototype] lasts 10 days
[Test prototype] starts at [Prototype design]'s end
@endgantt
```



```
@startgantt
[Prototype design] lasts 10 days
[Code prototype] lasts 10 days
[Write tests] lasts 5 days
[Code prototype] starts at [Prototype design]'s end
[Write tests] starts at [Code prototype]'s start
@endgantt
```



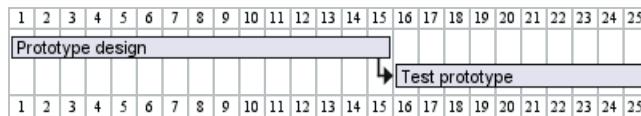
## 16.4 Short names

It is possible to define short name for tasks with the `as` keyword.

```
@startgantt
[Prototype design] as [D] lasts 15 days
[Test prototype] as [T] lasts 10 days
```



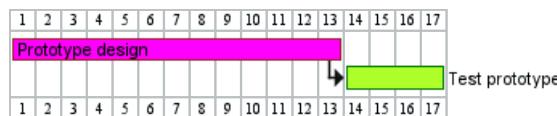
```
[T] starts at [D]'s end
@endgantt
```



## 16.5 Customize colors

It is also possible to customize colors with `is colored in`.

```
@startgantt
[Prototype design] lasts 13 days
[Test prototype] lasts 4 days
[Test prototype] starts at [Prototype design]'s end
[Prototype design] is colored in Fuchsia/FireBrick
[Test prototype] is colored in GreenYellow/Green
@endgantt
```



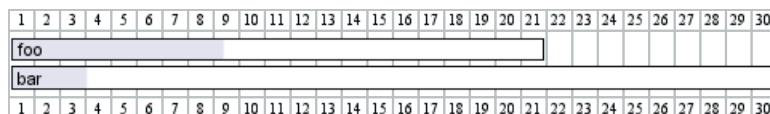
## 16.6 Completion status

### 16.6.1 Adding completion depending percentage

You can set the completion status of a task, by the command:

- `is xx% completed`
- `is xx% complete`

```
@startgantt
[foo] lasts 21 days
[foo] is 40% completed
[bar] lasts 30 days and is 10% complete
@endgantt
```



### 16.6.2 Change colour of completion (by style)

```
@startgantt
```

```
<style>
ganttDiagram {
    task {
        BackGroundColor GreenYellow
        LineColor Green
        unstarted {
            BackGroundColor Fuchsia
            LineColor FireBrick
        }
    }
}
</style>
```

```
[Prototype design] lasts 7 days
```

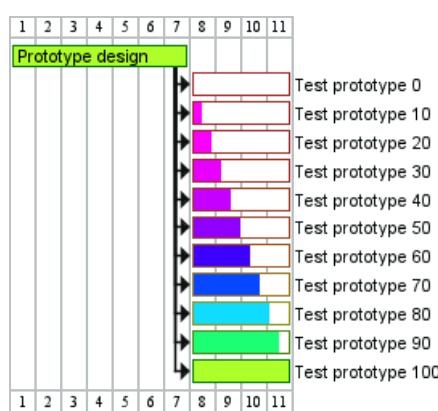


```
[Test prototype 0] lasts 4 days
[Test prototype 10] lasts 4 days
[Test prototype 20] lasts 4 days
[Test prototype 30] lasts 4 days
[Test prototype 40] lasts 4 days
[Test prototype 50] lasts 4 days
[Test prototype 60] lasts 4 days
[Test prototype 70] lasts 4 days
[Test prototype 80] lasts 4 days
[Test prototype 90] lasts 4 days
[Test prototype 100] lasts 4 days

[Test prototype 0] starts at [Prototype design]'s end
[Test prototype 10] starts at [Prototype design]'s end
[Test prototype 20] starts at [Prototype design]'s end
[Test prototype 30] starts at [Prototype design]'s end
[Test prototype 40] starts at [Prototype design]'s end
[Test prototype 50] starts at [Prototype design]'s end
[Test prototype 60] starts at [Prototype design]'s end
[Test prototype 70] starts at [Prototype design]'s end
[Test prototype 80] starts at [Prototype design]'s end
[Test prototype 90] starts at [Prototype design]'s end
[Test prototype 100] starts at [Prototype design]'s end

[Test prototype 0] is 0% complete
[Test prototype 10] is 10% complete
[Test prototype 20] is 20% complete
[Test prototype 30] is 30% complete
[Test prototype 40] is 40% complete
[Test prototype 50] is 50% complete
[Test prototype 60] is 60% complete
[Test prototype 70] is 70% complete
[Test prototype 80] is 80% complete
[Test prototype 90] is 90% complete
[Test prototype 100] is 100% complete
```

@endgantt



[Ref. QA-8297]

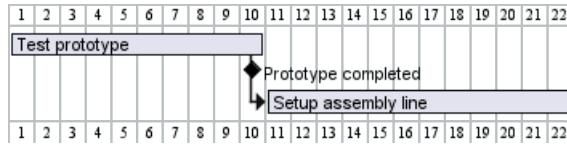
## 16.7 Milestone

You can define Milestones using the `happen` verb.



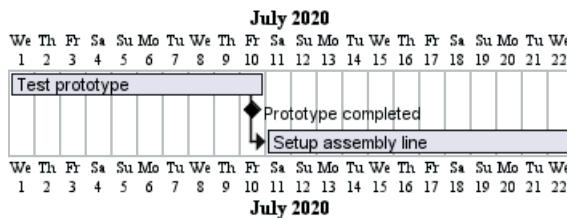
### 16.7.1 Relative milestone (use of constraints)

```
@startgantt
[Test prototype] lasts 10 days
[Prototype completed] happens at [Test prototype]'s end
[Setup assembly line] lasts 12 days
[Setup assembly line] starts at [Test prototype]'s end
@endgantt
```



### 16.7.2 Absolute milestone (use of fixed date)

```
@startgantt
Project starts 2020-07-01
[Test prototype] lasts 10 days
[Prototype completed] happens 2020-07-10
[Setup assembly line] lasts 12 days
[Setup assembly line] starts at [Test prototype]'s end
@endgantt
```

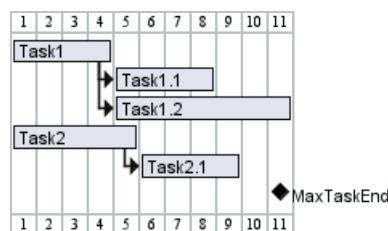


### 16.7.3 Milestone of maximum end of tasks

```
@startgantt
[Task1] lasts 4 days
then [Task1.1] lasts 4 days
[Task1.2] starts at [Task1]'s end and lasts 7 days

[Task2] lasts 5 days
then [Task2.1] lasts 4 days

[MaxTaskEnd] happens at [Task1.1]'s end
[MaxTaskEnd] happens at [Task1.2]'s end
[MaxTaskEnd] happens at [Task2.1]'s end
@endgantt
```



[Ref. QA-10764]

## 16.8 Hyperlinks

You can add hyperlinks to tasks.



```
@startgantt
[task1] lasts 10 days
[task1] links to [[http://plantuml.com]]
@endgantt
```



## 16.9 Calendar

You can specify a starting date for the whole project. By default, the first task starts at this date.

```
@startgantt
Project starts the 20th of september 2017
[Prototype design] as [TASK1] lasts 13 days
[TASK1] is colored in Lavender/LightBlue
@endgantt
```



## 16.10 Coloring days

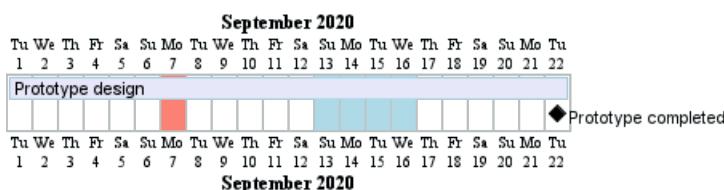
It is possible to add colors to some days.

```
@startgantt
Project starts the 2020/09/01
```

2020/09/07 is colored in salmon

2020/09/13 to 2020/09/16 are colored in lightblue

```
[Prototype design] as [TASK1] lasts 22 days
[TASK1] is colored in Lavender/LightBlue
[Prototype completed] happens at [TASK1]'s end
@endgantt
```



## 16.11 Changing scale

You can change scale for very long project, with one of those parameters:

- printscale
- ganttscale
- projectscale

and one of the values:

- daily (*by default*)
- weekly
- monthly



- quarterly
- yearly

(See QA-11272, QA-9041 and QA-10948)

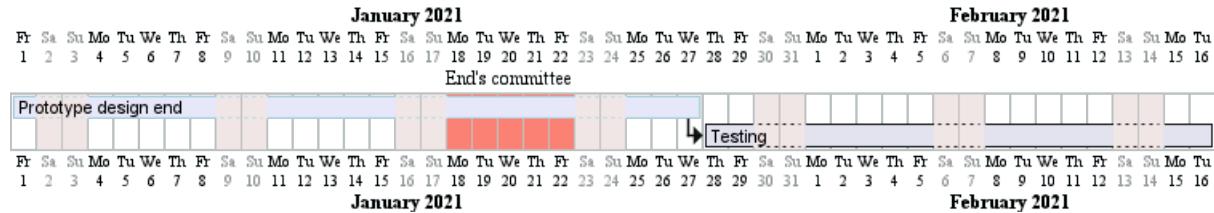
### 16.11.1 Daily (by default)

```
@startgantt
saturday are closed
sunday are closed
```

Project starts the 1st of january 2021  
 [Prototype design end] as [TASK1] lasts 19 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 14 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon

```
@endgantt
```



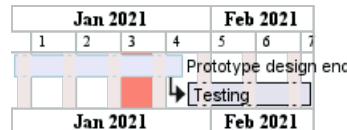
### 16.11.2 Weekly

```
@startgantt
printscale weekly
saturday are closed
sunday are closed
```

Project starts the 1st of january 2021  
 [Prototype design end] as [TASK1] lasts 19 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 14 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon

```
@endgantt
```

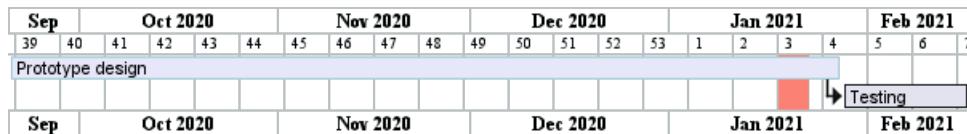


```
@startgantt
printscale weekly
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are named [End's committee]



2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



### 16.11.3 Monthly

```
@startgantt
projectscale monthly
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

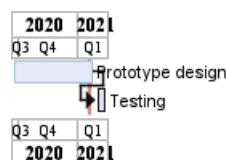
2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



### 16.11.4 Quarterly

```
@startgantt
projectscale quarterly
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

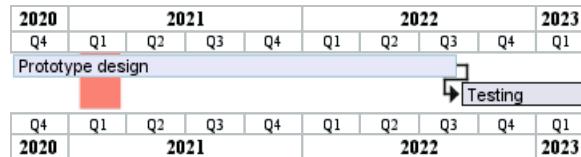
2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



```
@startgantt
projectscale quarterly
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-03-22 are colored in salmon  
 @endgantt

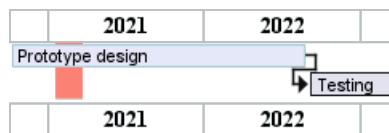




### 16.11.5 Yearly

```
@startgantt
projectscale yearly
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-03-22 are colored in salmon  
@endgantt



## 16.12 Zoom (example for all scale)

You can change zoom, with the parameter:

- `zoom <integer>`

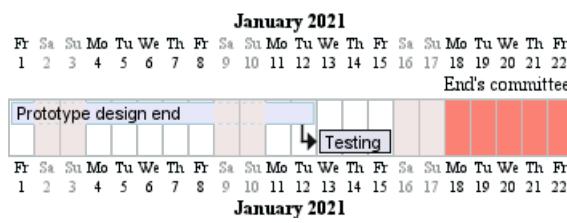
### 16.12.1 Zoom on weekly scale

### 16.12.2 Without zoom

```
@startgantt
printscale daily
saturday are closed
sunday are closed
```

Project starts the 1st of january 2021  
[Prototype design end] as [TASK1] lasts 8 days  
[TASK1] is colored in Lavender/LightBlue  
[Testing] lasts 3 days  
[TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]  
2021-01-18 to 2021-01-22 are colored in salmon  
@endgantt



### 16.12.3 With zoom

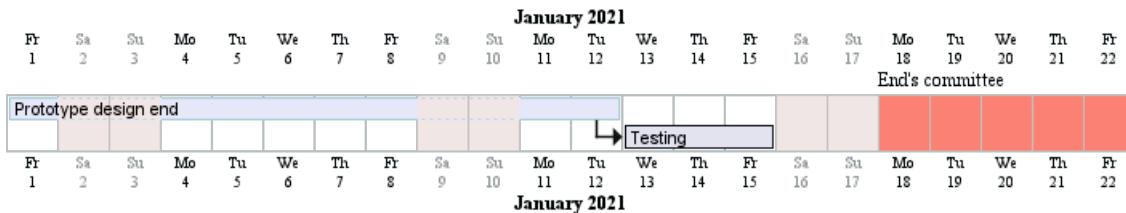
```
@startgantt
printscale daily zoom 2
```



saturday are closed  
sunday are closed

Project starts the 1st of january 2021  
[Prototype design end] as [TASK1] lasts 8 days  
[TASK1] is colored in Lavender/LightBlue  
[Testing] lasts 3 days  
[TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]  
2021-01-18 to 2021-01-22 are colored in salmon  
@endgantt



[Ref. QA-13725]

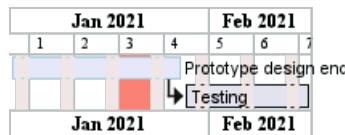
#### 16.12.4 Zoom on weekly scale

#### 16.12.5 Without zoom

@startgantt  
printscale weekly  
saturday are closed  
sunday are closed

Project starts the 1st of january 2021  
[Prototype design end] as [TASK1] lasts 19 days  
[TASK1] is colored in Lavender/LightBlue  
[Testing] lasts 14 days  
[TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]  
2021-01-18 to 2021-01-22 are colored in salmon  
@endgantt



#### 16.12.6 With zoom

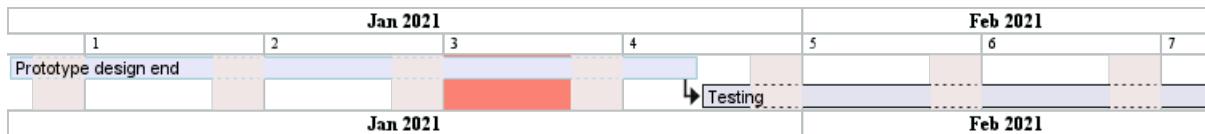
@startgantt  
printscale weekly zoom 4  
saturday are closed  
sunday are closed

Project starts the 1st of january 2021  
[Prototype design end] as [TASK1] lasts 19 days  
[TASK1] is colored in Lavender/LightBlue  
[Testing] lasts 14 days  
[TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]



2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



### 16.12.7 Zoom on monthly scale

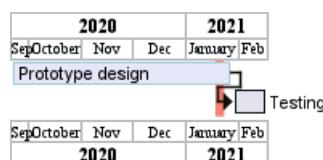
#### 16.12.8 Without zoom

```
@startgantt
projectscale monthly
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are named [End's committee]

2021-01-18 to 2021-01-22 are colored in salmon

@endgantt



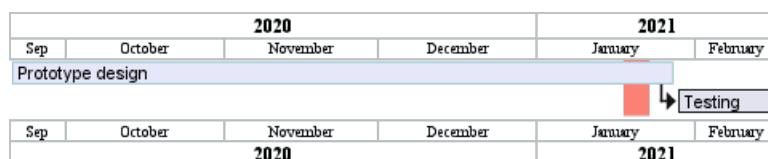
#### 16.12.9 With zoom

```
@startgantt
projectscale monthly zoom 3
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are named [End's committee]

2021-01-18 to 2021-01-22 are colored in salmon

@endgantt



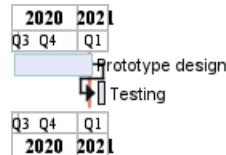
#### 16.12.10 Zoom on quarterly scale

#### 16.12.11 Without zoom

```
@startgantt
projectscale quarterly
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```



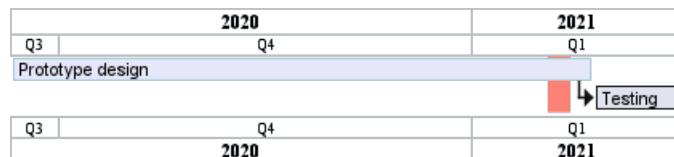
2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



#### 16.12.12 With zoom

```
@startgantt
projectscale quarterly zoom 7
Project starts the 20th of september 2020
[Prototype design] as [TASK1] lasts 130 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 20 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are named [End's committee]  
 2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



#### 16.12.13 Zoom on yearly scale

#### 16.12.14 Without zoom

```
@startgantt
projectscale yearly
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-03-22 are colored in salmon  
 @endgantt

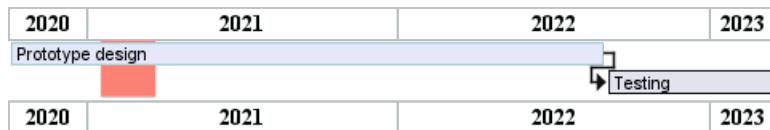


#### 16.12.15 With zoom

```
@startgantt
projectscale yearly zoom 2
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```



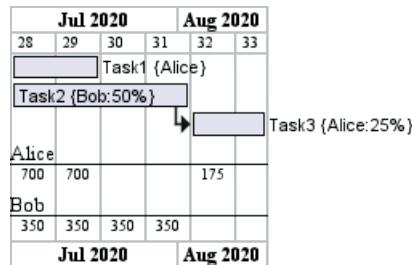
2021-01-18 to 2021-03-22 are colored in salmon  
@endgantt



## 16.13 Weekscale with Weeknumbers or Calendar Date

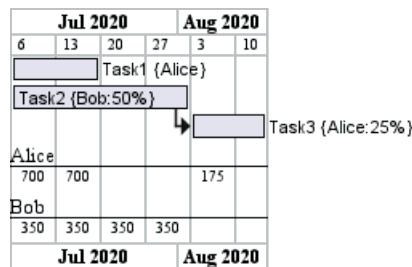
### 16.13.1 With Weeknumbers (by default)

```
@startgantt
printscale weekly
Project starts the 6th of July 2020
[Task1] on {Alice} lasts 2 weeks
[Task2] on {Bob:50%} lasts 2 weeks
then [Task3] on {Alice:25%} lasts 3 days
@endgantt
```



### 16.13.2 With Calendar Date

```
@startgantt
printscale weekly with calendar date
Project starts the 6th of July 2020
[Task1] on {Alice} lasts 2 weeks
[Task2] on {Bob:50%} lasts 2 weeks
then [Task3] on {Alice:25%} lasts 3 days
@endgantt
```



[Ref. QA-11630]

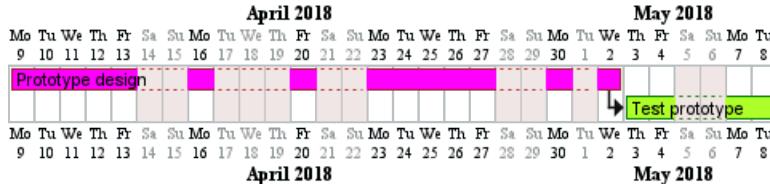
## 16.14 Close day

It is possible to close some day.

```
@startgantt
project starts the 2018/04/09
saturday are closed
sunday are closed
2018/05/01 is closed
2018/04/17 to 2018/04/19 is closed
[Prototype design] lasts 14 days
```



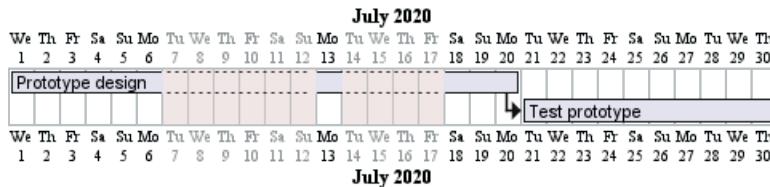
[Test prototype] lasts 4 days  
 [Test prototype] starts at [Prototype design]'s end  
 [Prototype design] is colored in Fuchsia/FireBrick  
 [Test prototype] is colored in GreenYellow/Green  
 @endgantt



Then it is possible to open some closed day.

@startgantt  
 2020-07-07 to 2020-07-17 is closed  
 2020-07-13 is open

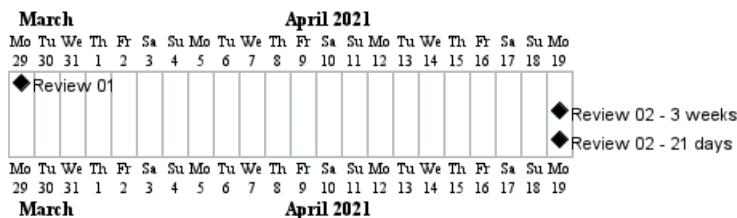
Project starts the 2020-07-01  
 [Prototype design] lasts 10 days  
 Then [Test prototype] lasts 10 days  
 @endgantt



## 16.15 Definition of a week depending of closed days

A week is a synonym for how many non-closed days are in a week, as:

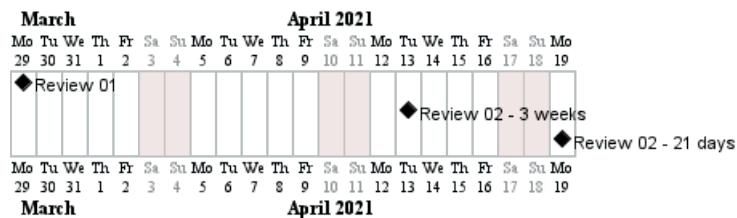
@startgantt  
 Project starts 2021-03-29  
 [Review 01] happens at 2021-03-29  
 [Review 02 - 3 weeks] happens on 3 weeks after [Review 01]'s end  
 [Review 02 - 21 days] happens on 21 days after [Review 01]'s end  
 @endgantt



So if you specify Saturday and Sunday as closed, a week will be equivalent to 5 days, as:

@startgantt  
 Project starts 2021-03-29  
 saturday are closed  
 sunday are closed  
 [Review 01] happens at 2021-03-29  
 [Review 02 - 3 weeks] happens on 3 weeks after [Review 01]'s end  
 [Review 02 - 21 days] happens on 21 days after [Review 01]'s end  
 @endgantt





[Ref. QA-13434]

## 16.16 Working days

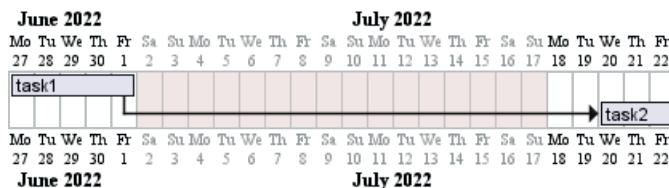
It is possible to manage working days.

@startgantt

saturday are closed  
sunday are closed  
2022-07-04 to 2022-07-15 is closed

Project starts 2022-06-27  
[task1] starts at 2022-06-27 and lasts 1 week  
[task2] starts 2 working days after [task1]'s end and lasts 3 days

@endgantt



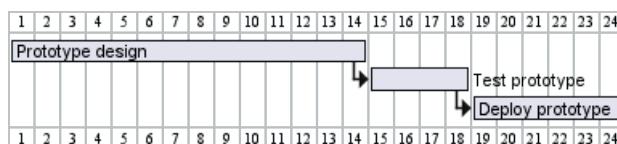
[Ref. QA-16188]

## 16.17 Simplified task succession

It's possible to use the then keyword to denote consecutive tasks.

@startgantt

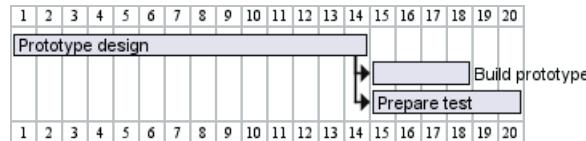
[Prototype design] lasts 14 days  
then [Test prototype] lasts 4 days  
then [Deploy prototype] lasts 6 days  
@endgantt



You can also use arrow ->

```
@startgantt
[Prototype design] lasts 14 days
[Build prototype] lasts 4 days
[Prepare test] lasts 6 days
[Prototype design] -> [Build prototype]
[Prototype design] -> [Prepare test]
@endgantt
```

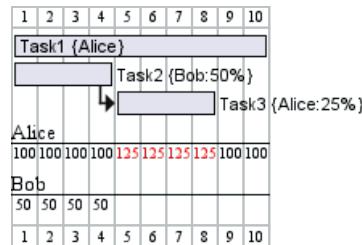




## 16.18 Working with resources

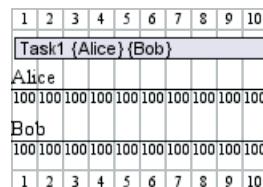
You can affect tasks on resources using the `on` keyword and brackets for resource name.

```
@startgantt
[Task1] on {Alice} lasts 10 days
[Task2] on {Bob:50%} lasts 2 days
then [Task3] on {Alice:25%} lasts 1 days
@endgantt
```



Multiple resources can be assigned to a task:

```
@startgantt
[Task1] on {Alice} {Bob} lasts 20 days
@endgantt
```



Resources can be marked as off on specific days:

```
@startgantt
project starts on 2020-06-19
[Task1] on {Alice} lasts 10 days
{Alice} is off on 2020-06-24 to 2020-06-26
@endgantt
```

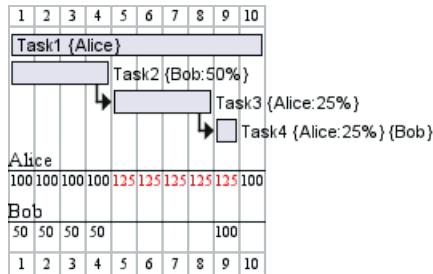


## 16.19 Hide resources

### 16.19.1 Without any hiding (by default)

```
@startgantt
[Task1] on {Alice} lasts 10 days
[Task2] on {Bob:50%} lasts 2 days
then [Task3] on {Alice:25%} lasts 1 days
then [Task4] on {Alice:25%} {Bob} lasts 1 days
@endgantt
```

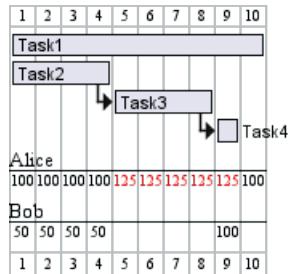




### 16.19.2 Hide resources names

You can hide resources names and percentage, on tasks, using the `hide resources names` keywords.

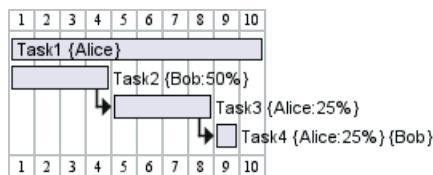
```
@startgantt
hide resources names
[Task1] on {Alice} lasts 10 days
[Task2] on {Bob:50%} lasts 2 days
then [Task3] on {Alice:25%} lasts 1 days
then [Task4] on {Alice:25%} {Bob} lasts 1 days
@endgantt
```



### 16.19.3 Hide resources footbox

You can also hide resources names on bottom of the diagram using the `hide resources footbox` keywords.

```
@startgantt
hide resources footbox
[Task1] on {Alice} lasts 10 days
[Task2] on {Bob:50%} lasts 2 days
then [Task3] on {Alice:25%} lasts 1 days
then [Task4] on {Alice:25%} {Bob} lasts 1 days
@endgantt
```



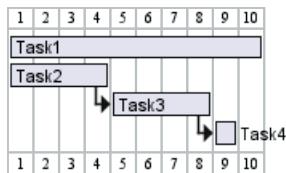
### 16.19.4 Hide the both (resources names and resources footbox)

You can also hide the both.

```
@startgantt
hide resources names
hide resources footbox
[Task1] on {Alice} lasts 10 days
[Task2] on {Bob:50%} lasts 2 days
then [Task3] on {Alice:25%} lasts 1 days
then [Task4] on {Alice:25%} {Bob} lasts 1 days
```



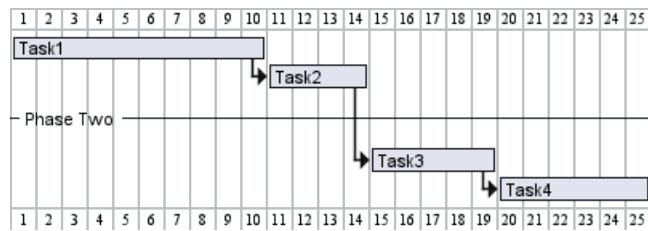
```
@endgantt
```



## 16.20 Horizontal Separator

You can use -- to separate sets of tasks.

```
@startgantt
[Task1] lasts 10 days
then [Task2] lasts 4 days
-- Phase Two --
then [Task3] lasts 5 days
then [Task4] lasts 6 days
@endgantt
```



## 16.21 Vertical Separator

You can add Vertical Separators with the syntax: Separator just [at].

```
@startgantt
[task1] lasts 1 week
[task2] starts 20 days after [task1]'s end and lasts 3 days

Separator just at [task1]'s end
Separator just 2 days after [task1]'s end

Separator just at [task2]'s start
Separator just 2 days before [task2]'s start
@endgantt
```



[Ref. QA-16247]

## 16.22 Complex example

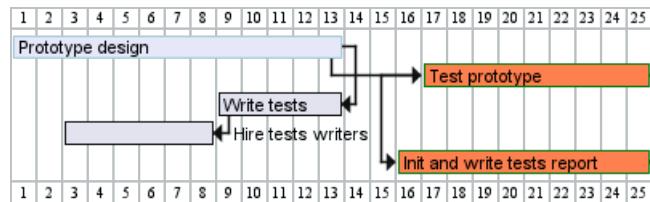
It also possible to use the and conjunction.

You can also add delays in constraints.

```
@startgantt
[Prototype design] lasts 13 days and is colored in Lavender/LightBlue
[Test prototype] lasts 9 days and is colored in Coral/Green and starts 3 days after [Prototype design]
[Write tests] lasts 5 days and ends at [Prototype design]'s end
[Hire tests writers] lasts 6 days and ends at [Write tests]'s start
[Init and write tests report] is colored in Coral/Green
```



[Init and write tests report] starts 1 day before [Test prototype]'s start and ends at [Test prototype]'s end  
@endgantt



## 16.23 Comments

As is mentioned on Common Commands page: blockquote Everything that starts with `simple quote '` is a comment.

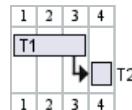
You can also put comments on several lines using `'` to start and `'` to end. blockquote (*i.e.: the first character (except space character) of a comment line must be a simple quote '*)

```
@startgantt
' This is a comment
```

[T1] lasts 3 days

```
/' this comment
is on several lines '/
```

[T2] starts at [T1]'s end and lasts 1 day  
@endgantt

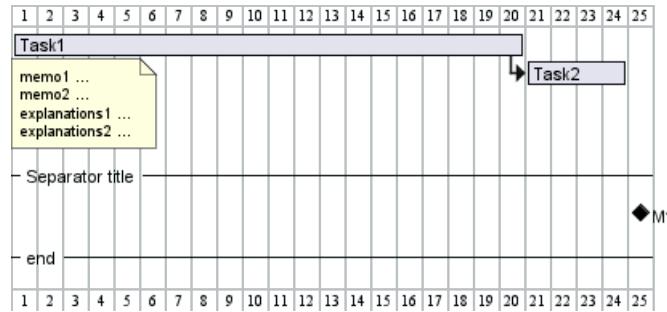


## 16.24 Using style

### 16.24.1 Without style (by default)

```
@startgantt
[Task1] lasts 20 days
note bottom
    memo1 ...
    memo2 ...
    explanations1 ...
    explanations2 ...
end note
[Task2] lasts 4 days
[Task1] -> [Task2]
-- Separator title --
[M1] happens on 5 days after [Task1]'s end
-- end --
@endgantt
```





### 16.24.2 With style

You can use style to change rendering of elements.

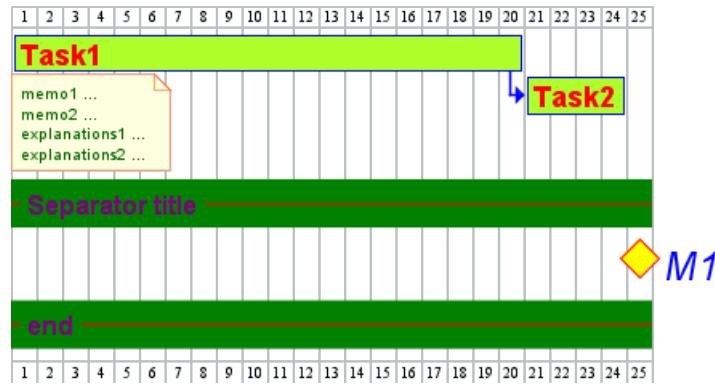
```
@startgantt
<style>
ganttDiagram {
task {
    FontName Helvetica
    FontColor red
    FontSize 18
    FontStyle bold
    BackGroundColor GreenYellow
    LineColor blue
}
milestone {
    FontColor blue
    FontSize 25
    FontStyle italic
    BackGroundColor yellow
    LineColor red
}
note {
    FontColor DarkGreen
    FontSize 10
    LineColor OrangeRed
}
arrow {
    FontName Helvetica
    FontColor red
    FontSize 18
    FontStyle bold
    BackGroundColor GreenYellow
    LineColor blue
}
separator {
    LineColor red
    BackGroundColor green
    FontSize 16
    FontStyle bold
    FontColor purple
}
}
</style>
[Task1] lasts 20 days
note bottom
    memo1 ...
    memo2 ...
```



```

explanations1 ...
explanations2 ...
end note
[Task2] lasts 4 days
[Task1] -> [Task2]
-- Separator title --
[M1] happens on 5 days after [Task1]'s end
-- end --
@endgantt

```



[Ref. QA-10835, QA-12045, QA-11877 and PR-438]

### 16.24.3 With style (full example)

```

@startgantt
<style>
ganttDiagram {
task {
FontName Helvetica
FontColor red
FontSize 18
FontStyle bold
BackGroundColor GreenYellow
LineColor blue
}
milestone {
FontColor blue
FontSize 25
FontStyle italic
BackGroundColor yellow
LineColor red
}
note {
FontColor DarkGreen
FontSize 10
LineColor OrangeRed
}
arrow {
FontName Helvetica
FontColor red
FontSize 18
FontStyle bold
BackGroundColor GreenYellow
LineColor blue
LineStyle 8.0;13.0
LineThickness 3.0
}

```



```
separator {
    BackgroundColor lightGreen
    LineStyle 8.0;3.0
    LineColor red
    LineThickness 1.0
    FontSize 16
    FontStyle bold
    FontColor purple
    Margin 5
    Padding 20
}
timeline {
    BackgroundColor Bisque
}
closed {
    BackgroundColor pink
    FontColor red
}
}
</style>
Project starts the 2020-12-01

[Task1] lasts 10 days
sunday are closed

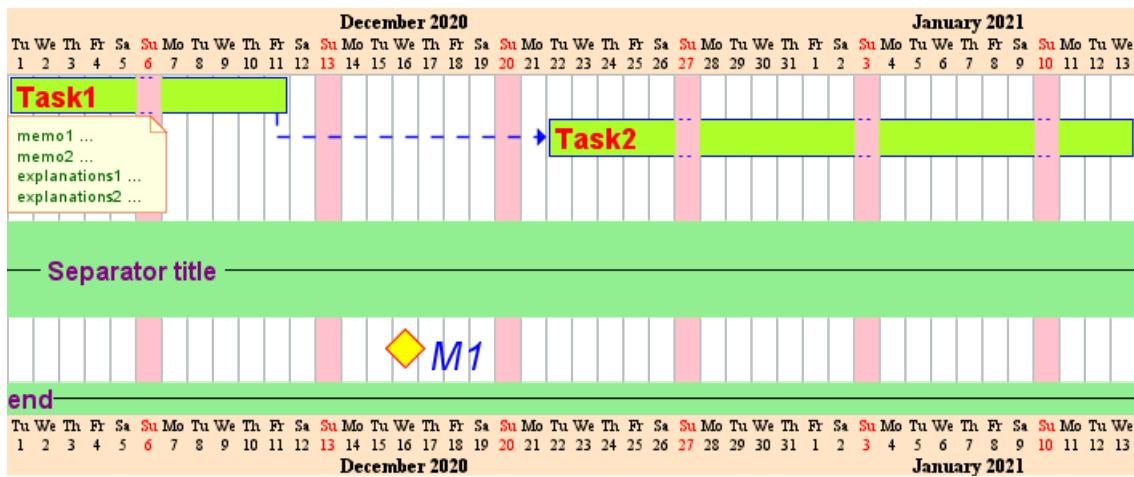
note bottom
    memo1 ...
    memo2 ...
    explanations1 ...
    explanations2 ...
end note

[Task2] lasts 20 days
[Task2] starts 10 days after [Task1]'s end
-- Separator title --
[M1] happens on 5 days after [Task1]'s end

<style>
separator {
    LineColor black
    Margin 0
    Padding 0
}
</style>

-- end --
@endgantt
```





[Ref. QA-13570, QA-13672]

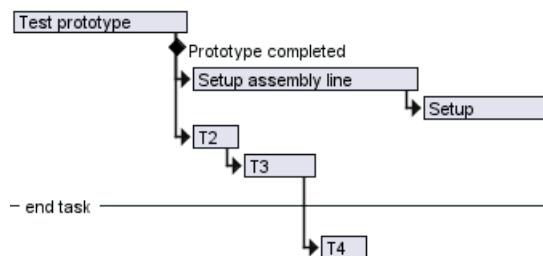
**TODO:** DONE Thanks for style for Separator and all style for Arrow (thickness...)

#### 16.24.4 Clean style

With style, you can also clean a Gantt diagram (*showing tasks, dependencies and relative durations only - but no actual start date and no actual scale*):

```
@startgantt
<style>
ganttDiagram {
    timeline {
        LineColor transparent
        FontColor transparent
    }
}
</style>

hide footbox
[Test prototype] lasts 7 days
[Prototype completed] happens at [Test prototype]'s end
[Setup assembly line] lasts 9 days
[Setup assembly line] starts at [Test prototype]'s end
then [Setup] lasts 5 days
[T2] lasts 2 days and starts at [Test prototype]'s end
then [T3] lasts 3 days
-- end task --
then [T4] lasts 2 days
@endgantt
```



[Ref. QA-13971]

Or:

```
@startgantt
```



```

<style>
ganttDiagram {
    timeline {
        LineColor transparent
        FontColor transparent
    }
    closed {
        FontColor transparent
    }
}
</style>

hide footbox
project starts the 2018/04/09
saturday are closed
sunday are closed
2018/05/01 is closed
2018/04/17 to 2018/04/19 is closed
[Prototype design] lasts 9 days
[Test prototype] lasts 5 days
[Test prototype] starts at [Prototype design]'s end
[Prototype design] is colored in Fuchsia/FireBrick
[Test prototype] is colored in GreenYellow/Green
@endgantt

```



[Ref. QA-13464]

## 16.25 Add notes

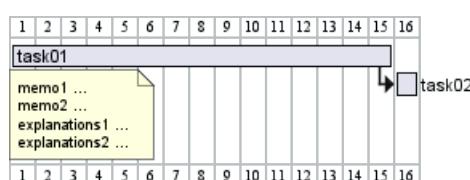
```

@startgantt
[task01] lasts 15 days
note bottom
    memo1 ...
    memo2 ...
    explanations1 ...
    explanations2 ...
end note

[task01] -> [task02]

@endgantt

```



Example with overlap.

```

@startgantt
[task01] lasts 15 days
note bottom
    memo1 ...
    memo2 ...

```

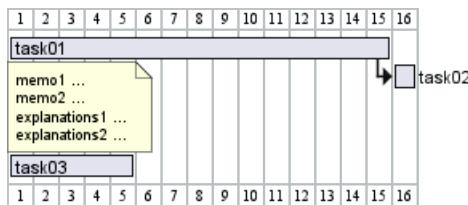
```

explanations1 ...
explanations2 ...
end note

[task01] -> [task02]
[task03] lasts 5 days

@endgantt

```



```
@startgantt
```

```
-- test01 --
```

```

[task01] lasts 4 days
note bottom
'note left
memo1 ...
memo2 ...
explanations1 ...
explanations2 ...
end note

```

```

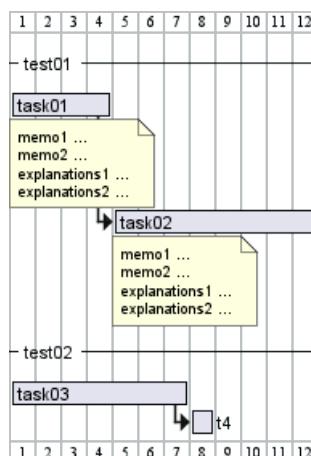
[task02] lasts 8 days
[task01] -> [task02]
note bottom
'note left
memo1 ...
memo2 ...
explanations1 ...
explanations2 ...
end note
-- test02 --

```

```

[task03] as [t3] lasts 7 days
[t3] -> [t4]
@endgantt

```



**TODO:** DONE *Thanks for correction (of #386 on v1.2020.18) when overlapping*

@startgantt

Project starts 2020-09-01

[taskA] starts 2020-09-01 and lasts 3 days  
 [taskB] starts 2020-09-10 and lasts 3 days  
 [taskB] displays on same row as [taskA]

[task01] starts 2020-09-05 and lasts 4 days

then [task02] lasts 8 days

note bottom

  note for task02

  more notes

end note

then [task03] lasts 7 days

note bottom

  note for task03

  more notes

end note

-- separator --

[taskC] starts 2020-09-02 and lasts 5 days  
 [taskD] starts 2020-09-09 and lasts 5 days  
 [taskD] displays on same row as [taskC]

[task 10] starts 2020-09-05 and lasts 5 days

then [task 11] lasts 5 days

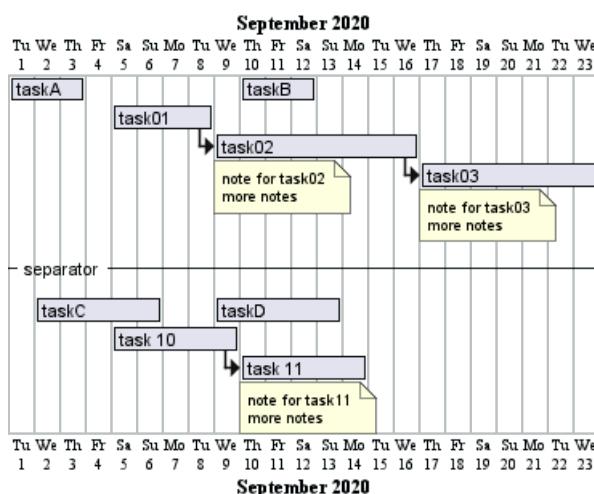
note bottom

  note for task11

  more notes

end note

@endgantt



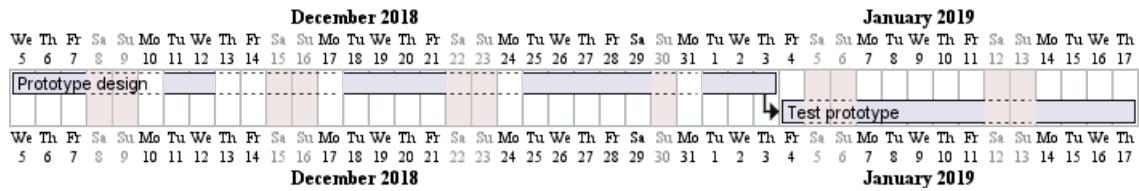
## 16.26 Pause tasks

@startgantt

Project starts the 5th of december 2018  
 saturday are closed



sunday are closed  
 2018/12/29 is opened  
 [Prototype design] lasts 17 days  
 [Prototype design] pauses on 2018/12/13  
 [Prototype design] pauses on 2018/12/14  
 [Prototype design] pauses on monday  
 [Test prototype] starts at [Prototype design]'s end and lasts 2 weeks  
 @endgantt

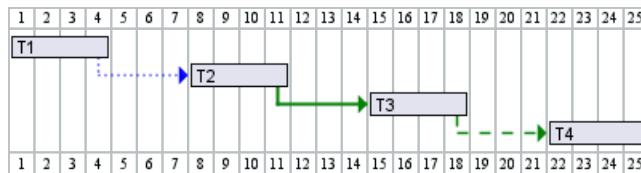


## 16.27 Change link colors

You can change link colors:

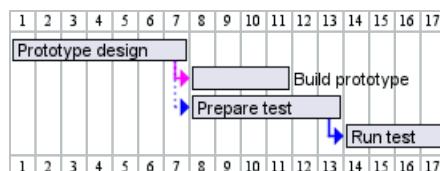
- with this syntax: with <color> <style> link

```
@startgantt
[T1] lasts 4 days
[T2] lasts 4 days and starts 3 days after [T1]'s end with blue dotted link
[T3] lasts 4 days and starts 3 days after [T2]'s end with green bold link
[T4] lasts 4 days and starts 3 days after [T3]'s end with green dashed link
@endgantt
```



- or directly by using arrow style

```
@startgantt
<style>
ganttDiagram {
arrow {
  LineColor blue
}
}
</style>
[Prototype design] lasts 7 days
[Build prototype] lasts 4 days
[Prepare test] lasts 6 days
[Prototype design] -[#FF00FF]-> [Build prototype]
[Prototype design] -[dotted]-> [Prepare test]
Then [Run test] lasts 4 days
@endgantt
```



[Ref. QA-13693]

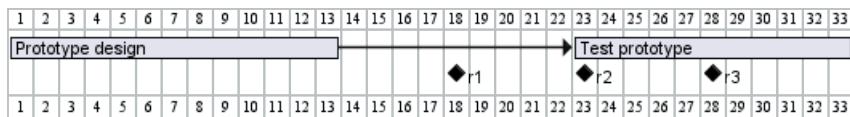


## 16.28 Tasks or Milestones on the same line

You can put Tasks or Milestones on the same line, with this syntax:

- [T|M] displays on same row as [T|M]

```
@startgantt
[Prototype design] lasts 13 days
[Test prototype] lasts 4 days and 1 week
[Test prototype] starts 1 week and 2 days after [Prototype design]'s end
[Test prototype] displays on same row as [Prototype design]
[r1] happens on 5 days after [Prototype design]'s end
[r2] happens on 5 days after [r1]'s end
[r3] happens on 5 days after [r2]'s end
[r2] displays on same row as [r1]
[r3] displays on same row as [r1]
@endgantt
```

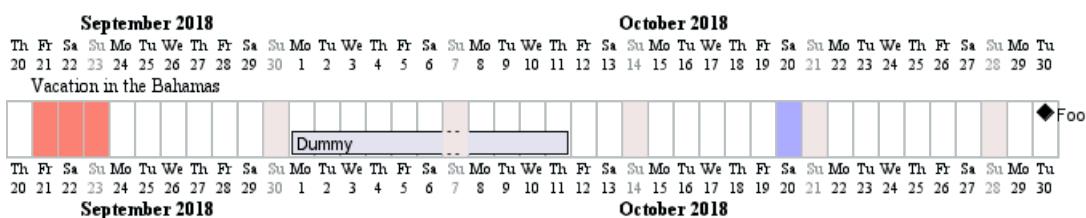


## 16.29 Highlight today

```
@startgantt
Project starts the 20th of september 2018
sunday are close
2018/09/21 to 2018/09/23 are colored in salmon
2018/09/21 to 2018/09/30 are named [Vacation in the Bahamas]

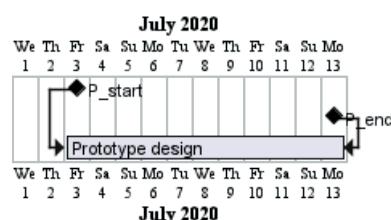
today is 30 days after start and is colored in #AAF
[Foo] happens 40 days after start
[Dummy] lasts 10 days and starts 10 days after start
```

@endgantt



## 16.30 Task between two milestones

```
@startgantt
project starts on 2020-07-01
[P_start] happens 2020-07-03
[P_end]    happens 2020-07-13
[Prototype design] occurs from [P_start] to [P_end]
@endgantt
```



### 16.31 Grammar and verbal form

Verbal form	Example
[T] starts	
[M] happens	

### 16.32 Add title, header, footer, caption or legend

```
@startgantt
```

```
header some header
```

```
footer some footer
```

```
title My title
```

```
[Prototype design] lasts 13 days
```

```
legend
```

```
The legend
```

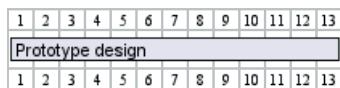
```
end legend
```

```
caption This is caption
```

```
@endgantt
```

some header

**My title**



The legend

This is caption

some footer

(See also: Common commands)

### 16.33 Removing Foot Boxes (example for all scale)

You can use the `hide footbox` keywords to remove the foot boxes of the gantt diagram (*as for sequence diagram*).

Examples on:

- daily scale (*without project start*)

```
@startgantt
```

```
hide footbox
```

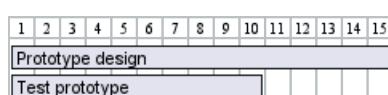
```
title Foot Box removed
```

```
[Prototype design] lasts 15 days
```

```
[Test prototype] lasts 10 days
```

```
@endgantt
```

**Foot Box removed**



- daily scale

```
@startgantt
```

Project starts the 20th of september 2017  
 [Prototype design] as [TASK1] lasts 13 days  
 [TASK1] is colored in Lavender/LightBlue

```
hide footbox
```

```
@endgantt
```



- weekly scale

```
@startgantt
```

```
hide footbox
```

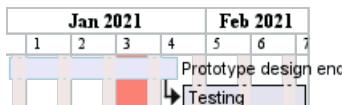
printscale weekly  
 saturday are closed  
 sunday are closed

Project starts the 1st of january 2021  
 [Prototype design end] as [TASK1] lasts 19 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 14 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]

2021-01-18 to 2021-01-22 are colored in salmon

```
@endgantt
```



- monthly scale

```
@startgantt
```

```
hide footbox
```

projectscale monthly  
 Project starts the 20th of september 2020  
 [Prototype design] as [TASK1] lasts 130 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 20 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are named [End's committee]

2021-01-18 to 2021-01-22 are colored in salmon

```
@endgantt
```



- quarterly scale

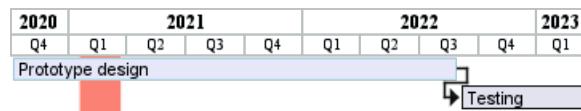
```
@startgantt
```



```
hide footbox
```

```
projectscale quarterly
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-03-22 are colored in salmon  
@endgantt



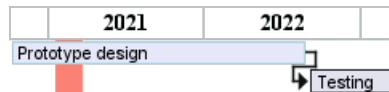
- yearly scale

```
@startgantt
```

```
hide footbox
```

```
projectscale yearly
Project starts the 1st of october 2020
[Prototype design] as [TASK1] lasts 700 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 200 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-03-22 are colored in salmon  
@endgantt



## 16.34 Language of the calendar

You can choose the language of the Gantt calendar, with the `language <xx>` command where `<xx>` is the ISO 639 code of the language.

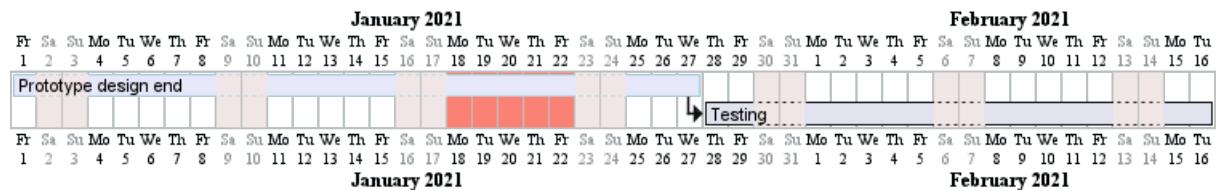
### 16.34.1 English (*en, by default*)

```
@startgantt
saturday are closed
sunday are closed
```

Project starts 2021-01-01  
[Prototype design end] as [TASK1] lasts 19 days  
[TASK1] is colored in Lavender/LightBlue  
[Testing] lasts 14 days  
[TASK1]->[Testing]

2021-01-18 to 2021-01-22 are colored in salmon  
@endgantt



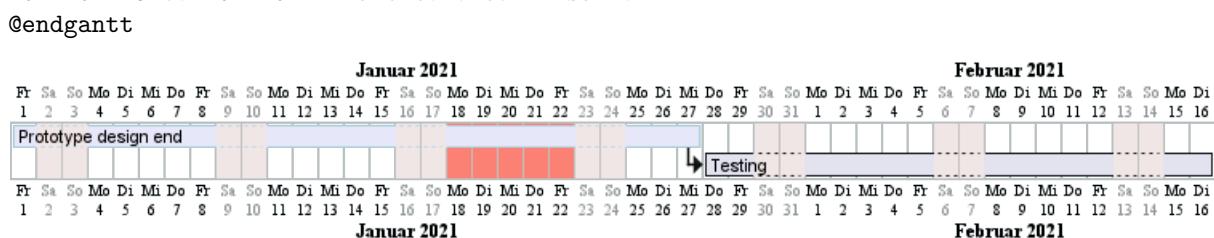


### 16.34.2 Deutsch (de)

```
@startgantt
language de
saturday are closed
sunday are closed

Project starts 2021-01-01
[Prototype design end] as [TASK1] lasts 19 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 14 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are colored in salmon

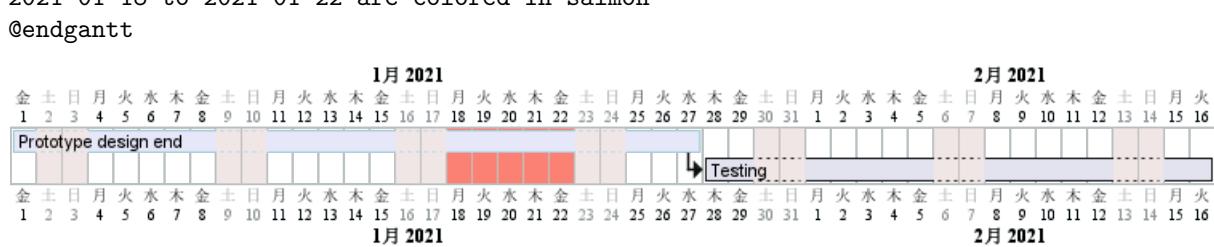


### 16.34.3 Japanese (ja)

```
@startgantt
language ja
saturday are closed
sunday are closed

Project starts 2021-01-01
[Prototype design end] as [TASK1] lasts 19 days
[TASK1] is colored in Lavender/LightBlue
[Testing] lasts 14 days
[TASK1]->[Testing]
```

2021-01-18 to 2021-01-22 are colored in salmon



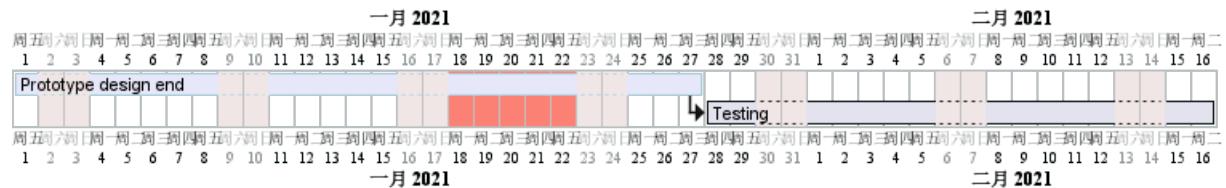
### 16.34.4 Chinese (zh)

```
@startgantt
language zh
saturday are closed
sunday are closed
```



Project starts 2021-01-01  
 [Prototype design end] as [TASK1] lasts 19 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 14 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt

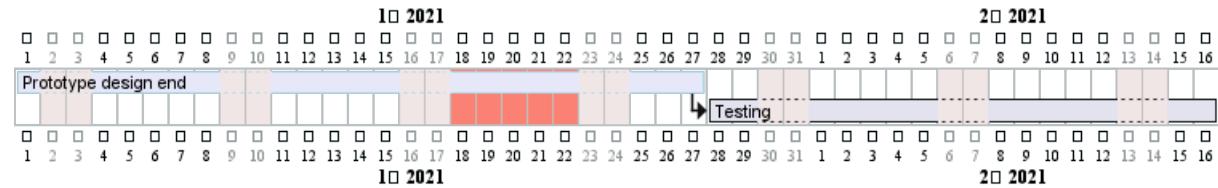


### 16.34.5 Korean (ko)

```
@startgantt
language ko
saturday are closed
sunday are closed
```

Project starts 2021-01-01  
 [Prototype design end] as [TASK1] lasts 19 days  
 [TASK1] is colored in Lavender/LightBlue  
 [Testing] lasts 14 days  
 [TASK1]->[Testing]

2021-01-18 to 2021-01-22 are colored in salmon  
 @endgantt



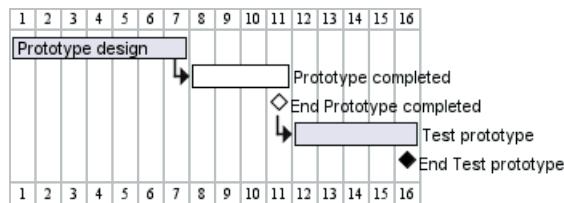
## 16.35 Delete Tasks or Milestones

You can mark some Tasks or Milestones as `deleted` instead of normally completed to distinguish tasks that may possibly have been discarded, postponed or whatever.

```
@startgantt
[Prototype design] lasts 1 weeks
then [Prototype completed] lasts 4 days
[End Prototype completed] happens at [Prototype completed]'s end
then [Test prototype] lasts 5 days
[End Test prototype] happens at [Test prototype]'s end

[Prototype completed] is deleted
[End Prototype completed] is deleted
@endgantt
```





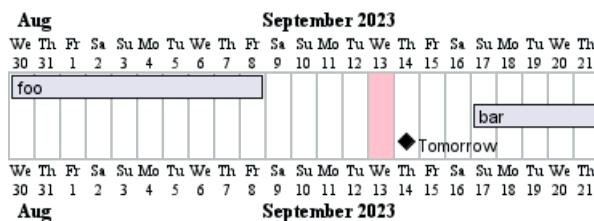
[Ref. QA-9129]

## 16.36 Start a project, a task or a milestone a number of days before or after today

You can start a project, a task or a milestone a number of days before or after today, using the builtin functions %now and %date:

```
@startgantt
title Today is %date("YYYY-MM-dd")
!$now = %now()
!$past = %date("YYYY-MM-dd", $now - 14*24*3600)
Project starts $past
today is colored in pink
[foo] lasts 10 days
[bar] lasts 5 days and starts %date("YYYY-MM-dd", $now + 4*24*3600)
[Tomorrow] happens %date("YYYY-MM-dd", $now + 1*24*3600)
@endgantt
```

**Today is 2023-09-13**



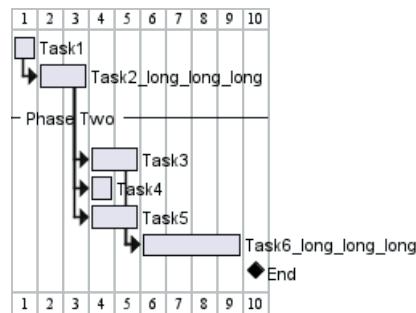
[Ref. QA-16285]

## 16.37 Change Label position

### 16.37.1 The labels are near elements (by default)

```
@startgantt
[Task1] lasts 1 days
then [Task2_long_long_long] as [T2] lasts 2 days
-- Phase Two --
then [Task3] as [T3] lasts 2 days
[Task4] as [T4] lasts 1 day
[Task5] as [T5] lasts 2 days
[T2] -> [T4]
[T2] -> [T5]
[Task6_long_long_long] as [T6] lasts 4 days
[T3] -> [T6]
[T5] -> [T6]
[End] happens 1 day after [T6]'s end
@endgantt
```



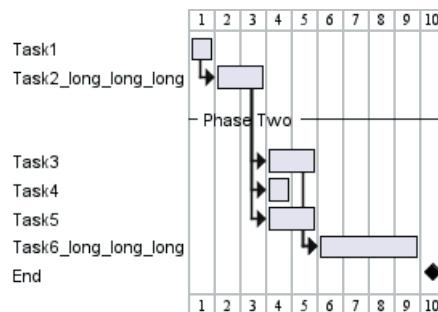


To change the label position, you can use the command `label`:

### 16.37.2 Label on first column

- Left aligned

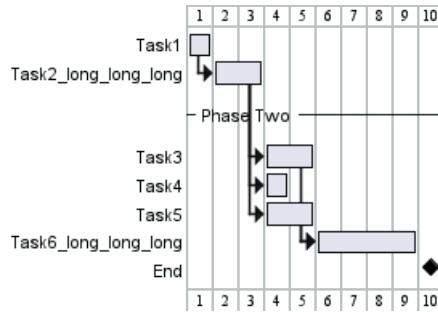
```
@startgantt
Label on first column and left aligned
[Task1] lasts 1 days
then [Task2_long_long_long] as [T2] lasts 2 days
-- Phase Two --
then [Task3] as [T3] lasts 2 days
[Task4] as [T4] lasts 1 day
[Task5] as [T5] lasts 2 days
[T2] -> [T4]
[T2] -> [T5]
[Task6_long_long_long] as [T6] lasts 4 days
[T3] -> [T6]
[T5] -> [T6]
[End] happens 1 day after [T6]'s end
@endgantt
```



- Right aligned

```
@startgantt
Label on first column and right aligned
[Task1] lasts 1 days
then [Task2_long_long_long] as [T2] lasts 2 days
-- Phase Two --
then [Task3] as [T3] lasts 2 days
[Task4] as [T4] lasts 1 day
[Task5] as [T5] lasts 2 days
[T2] -> [T4]
[T2] -> [T5]
[Task6_long_long_long] as [T6] lasts 4 days
[T3] -> [T6]
[T5] -> [T6]
[End] happens 1 day after [T6]'s end
@endgantt
```

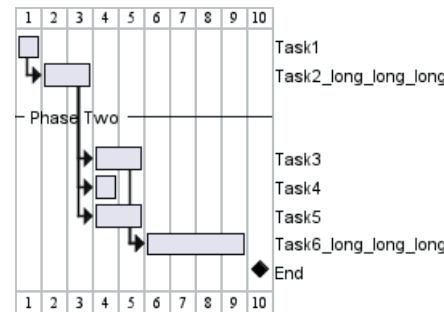




### 16.37.3 Label on last column

- Left aligned

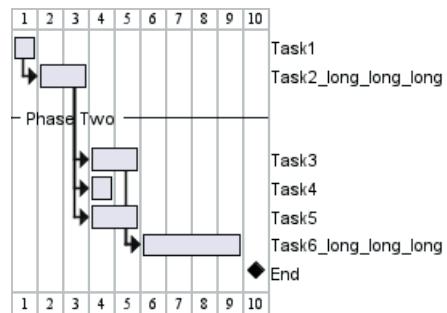
```
@startgantt
Label on last column and left aligned
[Task1] lasts 1 days
then [Task2_long_long_long] as [T2] lasts 2 days
-- Phase Two --
then [Task3] as [T3] lasts 2 days
[Task4] as [T4] lasts 1 day
[Task5] as [T5] lasts 2 days
[T2] -> [T4]
[T2] -> [T5]
[Task6_long_long_long] as [T6] lasts 4 days
[T3] -> [T6]
[T5] -> [T6]
[End] happens 1 day after [T6]'s end
@endgantt
```



- Right aligned

```
@startgantt
Label on last column and right aligned
[Task1] lasts 1 days
then [Task2_long_long_long] as [T2] lasts 2 days
-- Phase Two --
then [Task3] as [T3] lasts 2 days
[Task4] as [T4] lasts 1 day
[Task5] as [T5] lasts 2 days
[T2] -> [T4]
[T2] -> [T5]
[Task6_long_long_long] as [T6] lasts 4 days
[T3] -> [T6]
[T5] -> [T6]
[End] happens 1 day after [T6]'s end
@endgantt
```





[Ref. QA-12433]



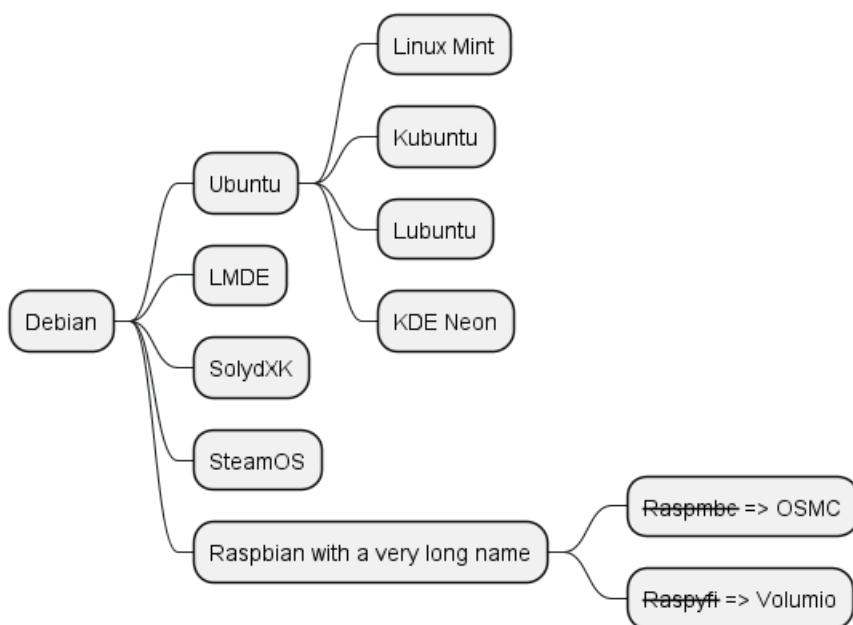
## 17 MindMap

MindMap diagram are still in beta: the syntax may change without notice.

### 17.1 OrgMode syntax

This syntax is compatible with OrgMode

```
@startmindmap
* Debian
** Ubuntu
*** Linux Mint
*** Kubuntu
*** Lubuntu
*** KDE Neon
** LMDE
** SolydXK
** SteamOS
** Raspbian with a very long name
*** <s>Raspmbc</s> => OSMC
*** <s>Raspyfi</s> => Volumio
@endmindmap
```

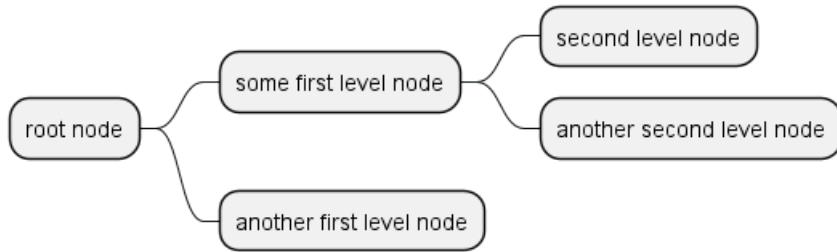


### 17.2 Markdown syntax

This syntax is compatible with Markdown

```
@startmindmap
* root node
* some first level node
* second level node
* another second level node
* another first level node
@endmindmap
```

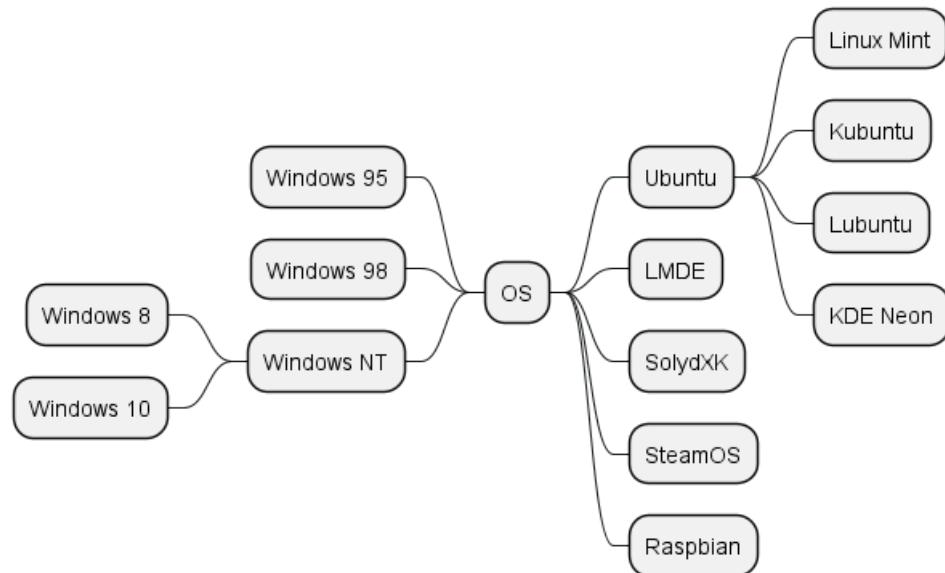




### 17.3 Arithmetic notation

You can use the following notation to choose diagram side.

```
@startmindmap
+ OS
++ Ubuntu
+++ Linux Mint
+++ Kubuntu
+++ Lubuntu
+++ KDE Neon
++ LMDE
++ SolydXK
++ SteamOS
++ Raspbian
-- Windows 95
-- Windows 98
-- Windows NT
--- Windows 8
--- Windows 10
@endmindmap
```



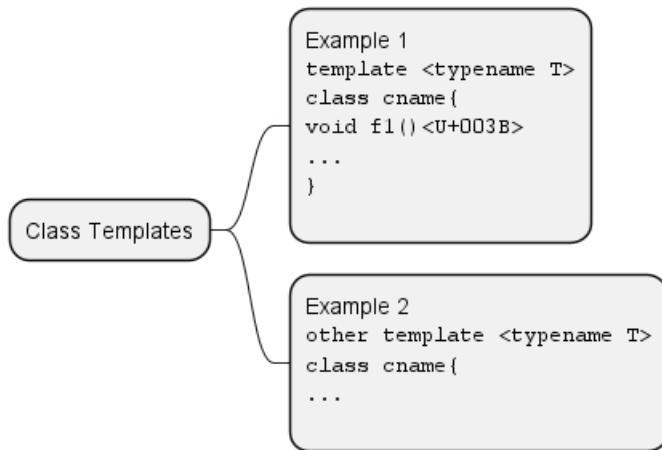
### 17.4 Multilines

You can use : and ; to have multilines box.

```
@startmindmap
* Class Templates
```



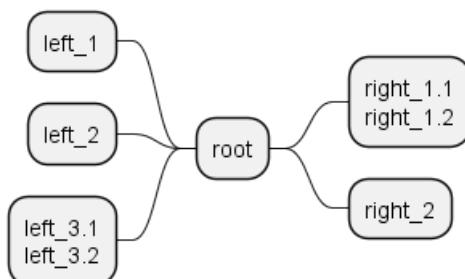
```
**:Example 1
<code>
template <typename T>
class cname{
void f1()<U+003B>
...
}
</code>
;
**:Example 2
<code>
other template <typename T>
class cname{
...
</code>
;
@endmindmap
```



```
@startmindmap
+ root
**:right_1.1
right_1.2;
++ right_2

left side

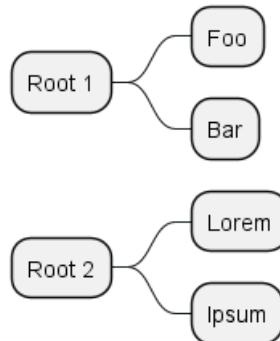
-- left_1
-- left_2
**:left_3.1
left_3.2;
@endmindmap
```



## 17.5 Multiroot Mindmap

You can create multiroot mindmap, as:

```
@startmindmap
* Root 1
** Foo
** Bar
* Root 2
** Lorem
** Ipsum
@endmindmap
```



[Ref. QH-773]

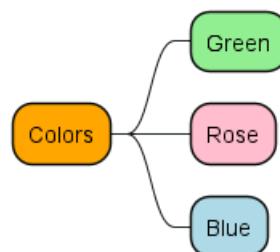
## 17.6 Colors

It is possible to change node color.

### 17.6.1 With inline color

- OrgMode syntax mindmap

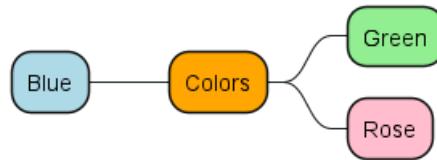
```
@startmindmap
*[#Orange] Colors
**[#lightgreen] Green
**[#FFBBCC] Rose
**[#lightblue] Blue
@endmindmap
```



- Arithmetic notation syntax mindmap

```
@startmindmap
+[#Orange] Colors
++[#lightgreen] Green
++[#FFBBCC] Rose
--[#lightblue] Blue
@endmindmap
```



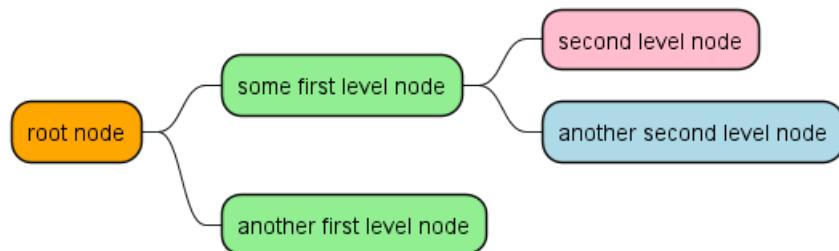


- Markdown syntax mindmap

```

@startmindmap
*[#Orange] root node
*[#lightgreen] some first level node
*[#FFBBCC] second level node
*[#lightblue] another second level node
*[#lightgreen] another first level node
@endmindmap

```



### 17.6.2 With style color

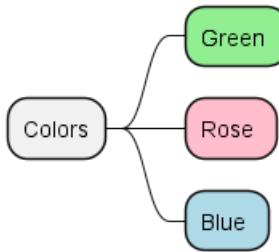
- OrgMode syntax mindmap

```

@startmindmap
<style>
mindmapDiagram {
    .green {
        BackgroundColor lightgreen
    }
    .rose {
        BackgroundColor #FFBBCC
    }
    .your_style_name {
        BackgroundColor lightblue
    }
}
</style>
* Colors
** Green <><>
** Rose <><>
** Blue <><>
@endmindmap

```

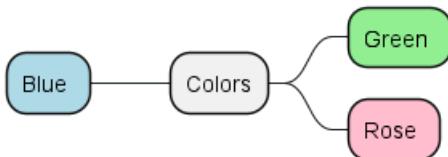




- Arithmetic notation syntax mindmap

```

@startmindmap
<style>
mindmapDiagram {
    .green {
        BackgroundColor lightgreen
    }
    .rose {
        BackgroundColor #FFBBCC
    }
    .your_style_name {
        BackgroundColor lightblue
    }
}
</style>
+ Colors
++ Green <><>
++ Rose <><>
-- Blue <><><><>
@endmindmap
  
```



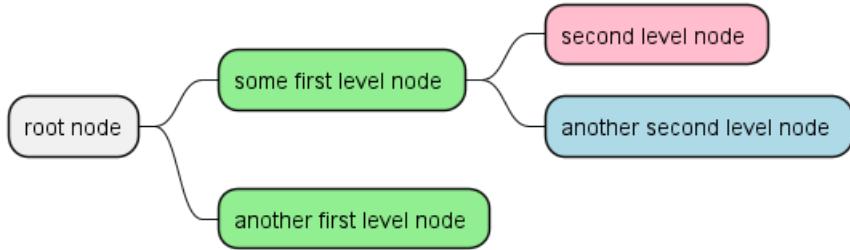
- Markdown syntax mindmap

```

@startmindmap
<style>
mindmapDiagram {
    .green {
        BackgroundColor lightgreen
    }
    .rose {
        BackgroundColor #FFBBCC
    }
    .your_style_name {
        BackgroundColor lightblue
    }
}
</style>
* root node
* some first level node <><>
  * second level node <><>
    * another second level node <><><><>
  
```

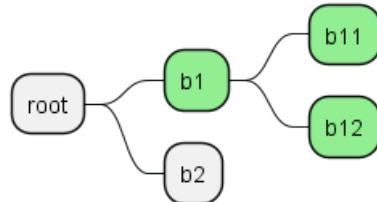


```
* another first level node <<green>>
@endmindmap
```



- Apply style to a branch

```
@startmindmap
<style>
mindmapDiagram {
    .myStyle * {
        backgroundColor lightgreen
    }
}
</style>
+ root
++ b1 <<myStyle>>
+++ b11
+++ b12
++ b2
@endmindmap
```



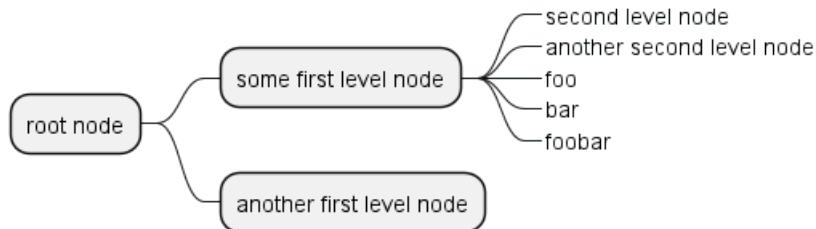
[Ref. GA-920]

## 17.7 Removing box

You can remove the box drawing using an underscore.

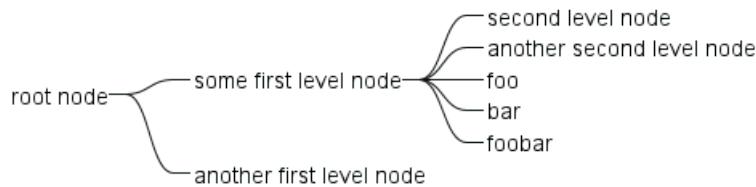
```
@startmindmap
* root node
** some first level node
***__ second level node
***__ another second level node
***__ foo
***__ bar
***__ foobar
** another first level node
@endmindmap
```





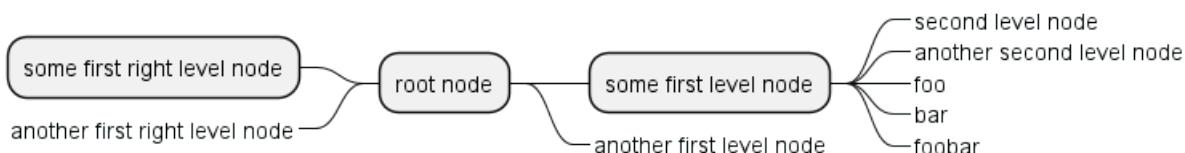
```

@startmindmap
*_ root node
**_ some first level node
***_ second level node
***_ another second level node
***_ foo
***_ bar
***_ foobar
**_ another first level node
@endmindmap
  
```



```

@startmindmap
+ root node
++ some first level node
+++ second level node
+++ another second level node
+++ foo
+++ bar
+++ foobar
++ another first level node
-- some first right level node
-- another first right level node
@endmindmap
  
```



## 17.8 Changing diagram direction

It is possible to use both sides of the diagram.

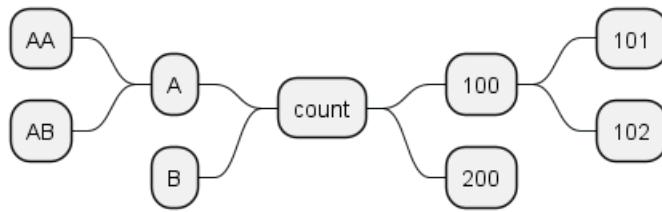
```

@startmindmap
* count
** 100
*** 101
*** 102
** 200
  
```



```
left side
```

```
** A
*** AA
*** AB
** B
@endmindmap
```



## 17.9 Complete example

```
@startmindmap
caption figure 1
title My super title

* <&flag>Debian
** <&globe>Ubuntu
*** Linux Mint
*** Kubuntu
*** Lubuntu
*** KDE Neon
** <&graph>LMDE
** <&pulse>SolydXK
** <&people>SteamOS
** <&star>Raspbian with a very long name
*** <s>Raspmbc</s> => OSMC
*** <s>Raspyfi</s> => Volumio
```

```
header
My super header
endheader
```

```
center footer My super footer
```

```
legend right
Short
legend
endlegend
@endmindmap
```



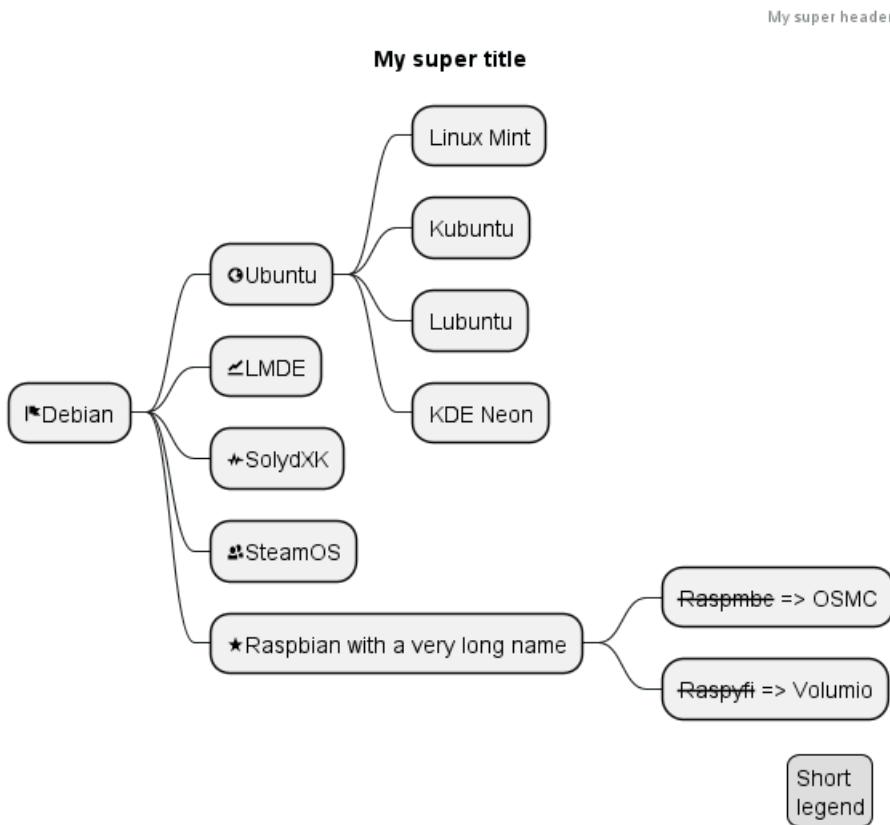


figure 1

## 17.10 Changing style

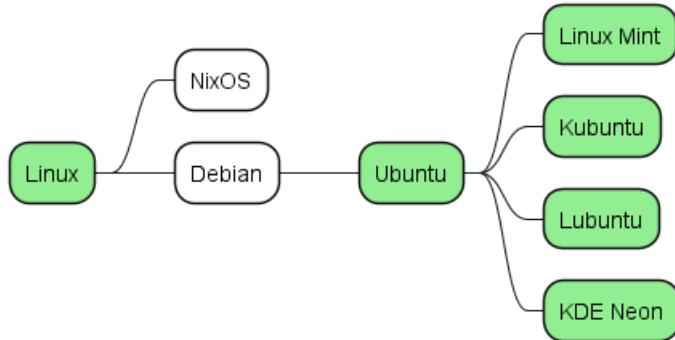
### 17.10.1 node, depth

```

@startmindmap
<style>
mindmapDiagram {
    node {
        backgroundColor lightGreen
    }
    :depth(1) {
        BackGroundColor white
    }
}
</style>
* Linux
** NixOS
** Debian
*** Ubuntu
**** Linux Mint
**** Kubuntu
**** Lubuntu
**** KDE Neon
@endmindmap

```

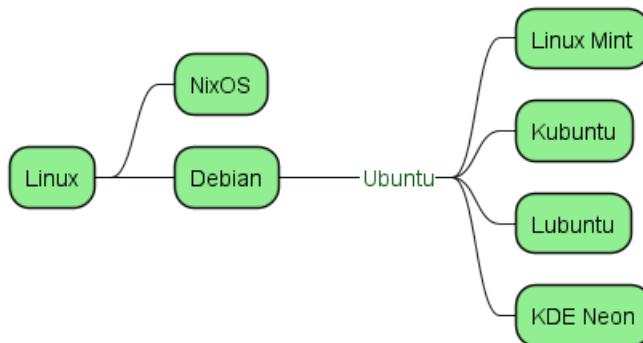




### 17.10.2 boxless

```

@startmindmap
<style>
mindmapDiagram {
    node {
        BackgroundColor lightGreen
    }
    boxless {
        FontColor darkgreen
    }
}
</style>
* Linux
** NixOS
** Debian
***_ Ubuntu
**** Linux Mint
**** Kubuntu
**** Lubuntu
**** KDE Neon
@endmindmap
  
```



## 17.11 Word Wrap

Using `MaximumWidth` setting you can control automatic word wrap. Unit used is pixel.

```
@startmindmap
```

```

<style>
node {
  
```

```

Padding 12
Margin 3
HorizontalAlignment center
LineColor blue
LineThickness 3.0
BackgroundColor gold
RoundCorner 40
MaximumWidth 100
}

rootNode {
    LineStyle 8.0;3.0
    LineColor red
    BackgroundColor white
    LineThickness 1.0
    RoundCorner 0
    Shadowing 0.0
}

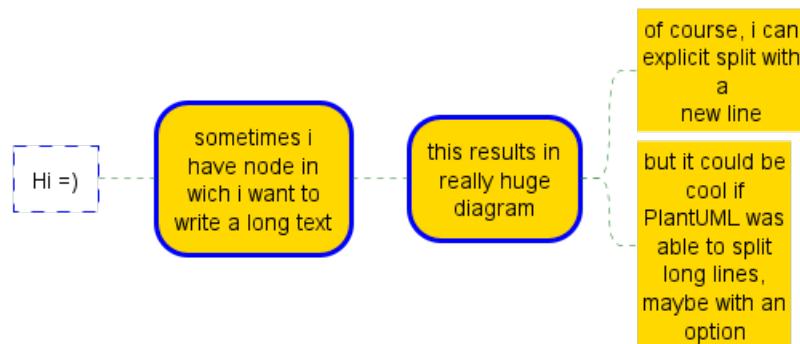
leafNode {
    LineColor gold
    RoundCorner 0
    Padding 3
}

arrow {
    LineStyle 4
    LineThickness 0.5
    LineColor green
}
</style>

* Hi =)
** sometimes i have node in which i want to write a long text
*** this results in really huge diagram
**** of course, i can explicit split with a\nnew line
**** but it could be cool if PlantUML was able to split long lines, maybe with an option

@endmindmap

```



## 17.12 Creole on Mindmap diagram

You can use Creole or HTML Creole on Mindmap:

```
@startmindmap
* Creole on Mindmap
```



```

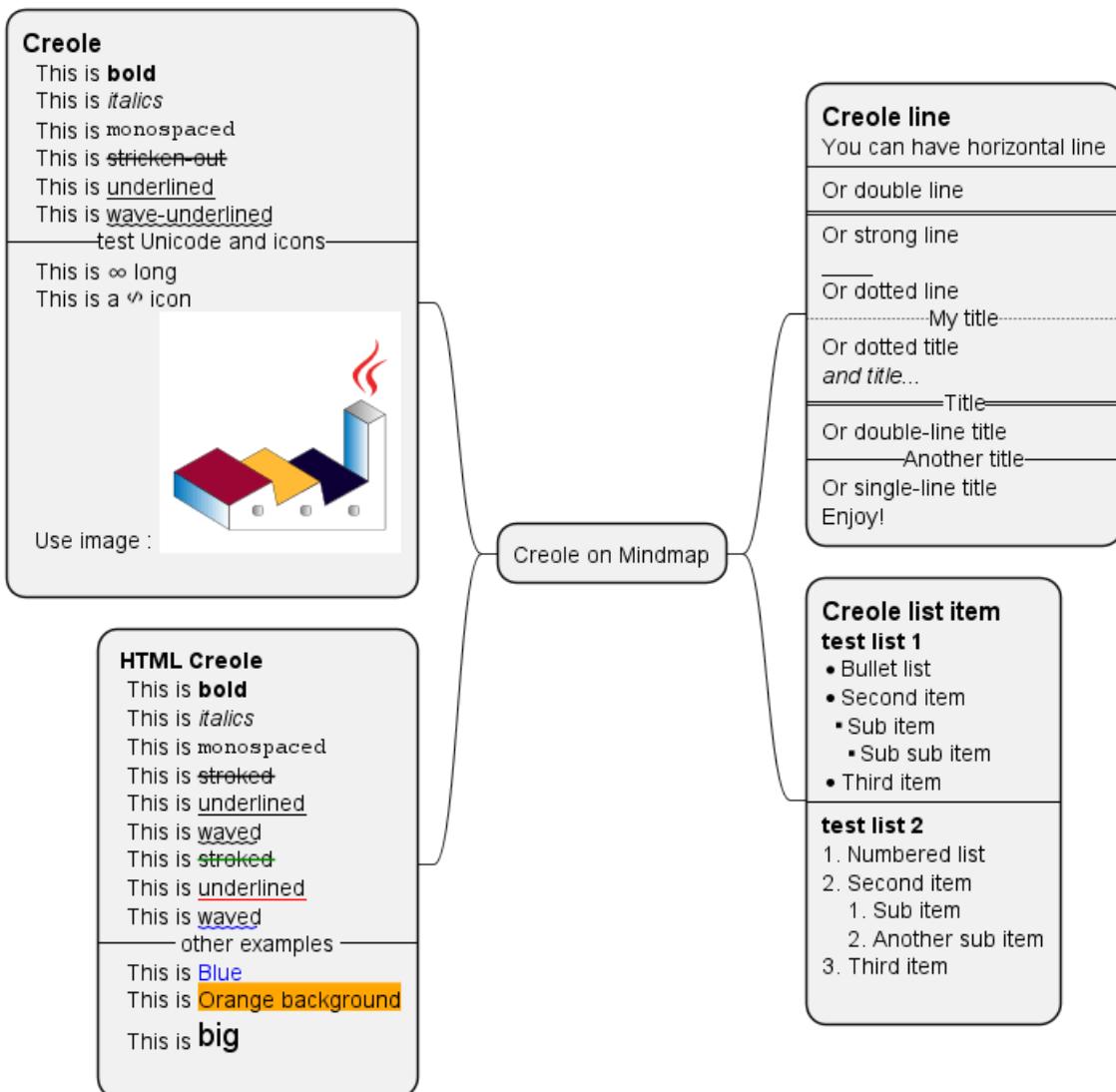
left side
**:=Creole
This is **bold**
This is //italics//
This is ""monospaced"""
This is --stricken-out--
This is __underlined__
This is ~~wave-underlined~~
--test Unicode and icons--
This is <U+221E> long
This is a <&code> icon
Use image : <img: http://plantuml.com/logo3.png>
;
**: <b>HTML Creole
This is <b>bold</b>
This is <i>italics</i>
This is <font:monospaced>monospaced</font>
This is <s>stroked</s>
This is <u>underlined</u>
This is <w>waved</w>
This is <s:green>stroked</s>
This is <u:red>underlined</u>
This is <w:#0000FF>waved</w>
-- other examples --
This is <color:blue>Blue</color>
This is <back:orange>Orange background</back>
This is <size:20>big</size>
;
right side
**:=Creole line
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
Or dotted title
//and title... //
==Title==
Or double-line title
--Another title--
Or single-line title
Enjoy!;

**:=Creole list item
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item

```



```
# Third item
;
@endmindmap
```



[Ref. QA-17838]



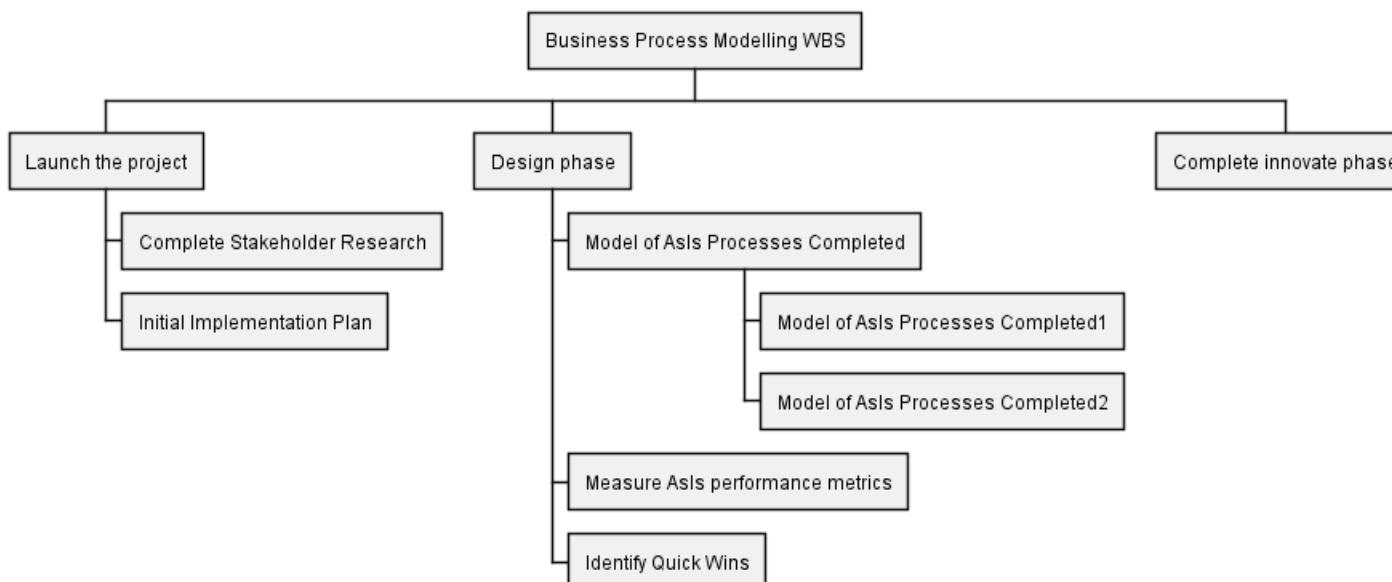
## 18 Work Breakdown Structure (WBS)

WBS diagram are still in beta: the syntax may change without notice.

### 18.1 OrgMode syntax

This syntax is compatible with OrgMode

```
@startwbs
* Business Process Modelling WBS
** Launch the project
*** Complete Stakeholder Research
*** Initial Implementation Plan
** Design phase
*** Model of AsIs Processes Completed
**** Model of AsIs Processes Completed1
**** Model of AsIs Processes Completed2
*** Measure AsIs performance metrics
*** Identify Quick Wins
** Complete innovate phase
@endwbs
```

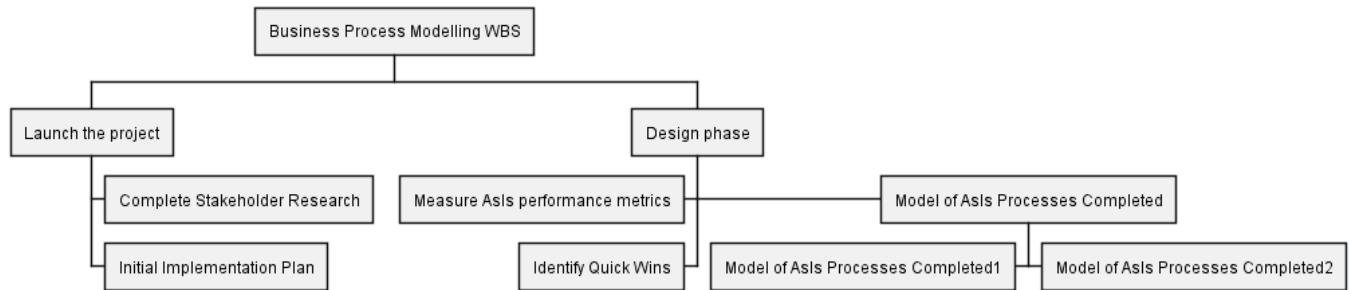


### 18.2 Change direction

You can change direction using < and >

```
@startwbs
* Business Process Modelling WBS
** Launch the project
*** Complete Stakeholder Research
*** Initial Implementation Plan
** Design phase
*** Model of AsIs Processes Completed
****< Model of AsIs Processes Completed1
****> Model of AsIs Processes Completed2
***< Measure AsIs performance metrics
***< Identify Quick Wins
@endwbs
```



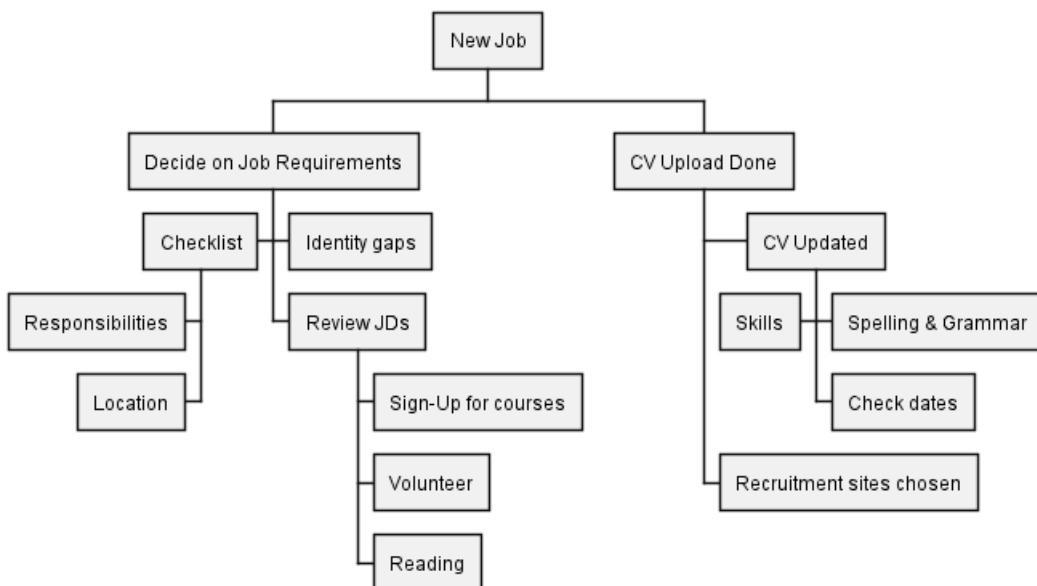


### 18.3 Arithmetic notation

You can use the following notation to choose diagram side.

```

@startwbs
+ New Job
++ Decide on Job Requirements
+++ Identity gaps
+++ Review JDs
++++ Sign-Up for courses
++++ Volunteer
++++ Reading
+++ Checklist
+++ Responsibilities
+++ Location
++ CV Upload Done
+++ CV Updated
++++ Spelling & Grammar
++++ Check dates
---- Skills
+++ Recruitment sites chosen
@endwbs
  
```



### 18.4 Multilines

You can use : and ; to have multilines box, as on MindMap.

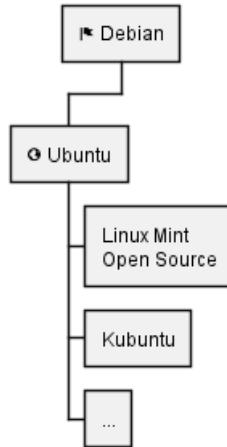
```
@startwbs
```



```
* <&flag> Debian
** <&globe> Ubuntu

***:Linux Mint
Open Source;

*** Kubuntu
*** ...
@endwbs
```



[Ref. QA-13945]

## 18.5 Removing box

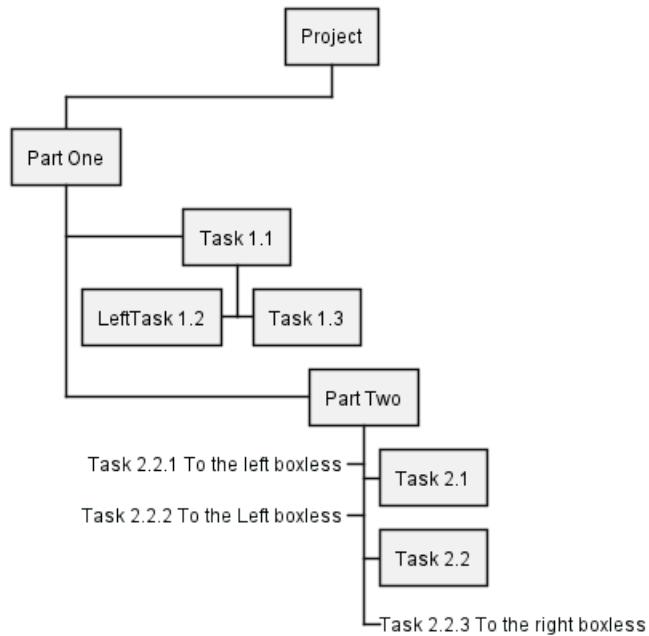
You can use underscore \_ to remove box drawing.

### 18.5.1 Boxless on Arithmetic notation

### 18.5.2 Several boxless node

```
@startwbs
+ Project
+ Part One
+ Task 1.1
- LeftTask 1.2
+ Task 1.3
+ Part Two
+ Task 2.1
+ Task 2.2
-_ Task 2.2.1 To the left boxless
-_ Task 2.2.2 To the Left boxless
+_ Task 2.2.3 To the right boxless
@endwbs
```



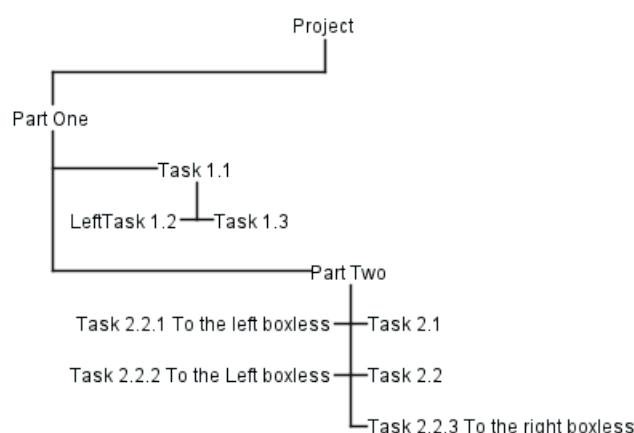


### 18.5.3 All boxless node

```

@startwbs
+_ Project
+_ Part One
+_ Task 1.1
- _ LeftTask 1.2
+_ Task 1.3
+_ Part Two
+_ Task 2.1
+_ Task 2.2
- _ Task 2.2.1 To the left boxless
- _ Task 2.2.2 To the Left boxless
+ _ Task 2.2.3 To the right boxless
@endwbs

```



### 18.5.4 Boxless on OrgMode syntax

#### 18.5.5 Several boxless node

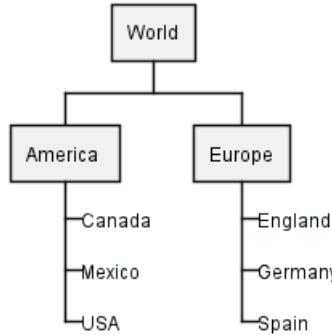
```

@startwbs
* World
** America

```



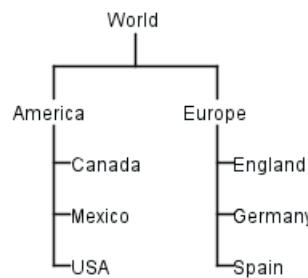
```
***_ Canada
***_ Mexico
***_ USA
** Europe
***_ England
***_ Germany
***_ Spain
@endwbs
```



[Ref. QA-13297]

#### 18.5.6 All boxless node

```
@startwbs
*_ World
**_ America
***_ Canada
***_ Mexico
***_ USA
**_ Europe
***_ England
***_ Germany
***_ Spain
@endwbs
```



[Ref. QA-13355]

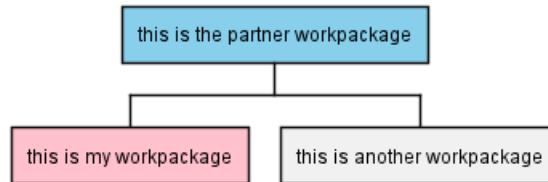
## 18.6 Colors (with inline or style color)

It is possible to change node color:

- with inline color

```
@startwbs
*[#SkyBlue] this is the partner workpackage
**[#pink] this is my workpackage
** this is another workpackage
@endwbs
```

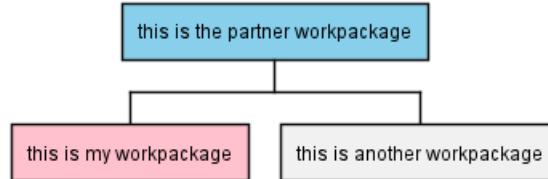




```

@startwbs
+[#SkyBlue] this is the partner workpackage
++[#pink] this is my workpackage
++ this is another workpackage
@endwbs

```



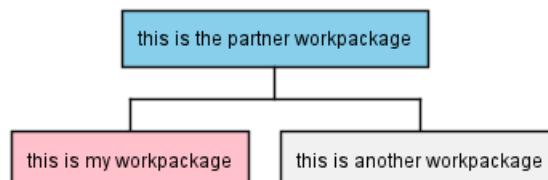
[Ref. QA-12374, only from v1.2020.20]

- with style color

```

@startwbs
<style>
wbsDiagram {
    .pink {
        BackgroundColor pink
    }
    .your_style_name {
        BackgroundColor SkyBlue
    }
}
</style>
* this is the partner workpackage <<your_style_name>>
** this is my workpackage <<pink>>
** this is another workpackage
@endwbs

```



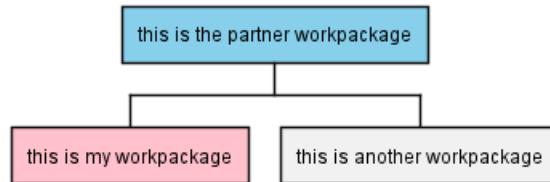
```

@startwbs
<style>
wbsDiagram {
    .pink {
        BackgroundColor pink
    }
    .your_style_name {
        BackgroundColor SkyBlue
    }
}
</style>
+ this is the partner workpackage <<your_style_name>>
++ this is my workpackage <<pink>>

```



```
++ this is another workpackage
@endwbs
```



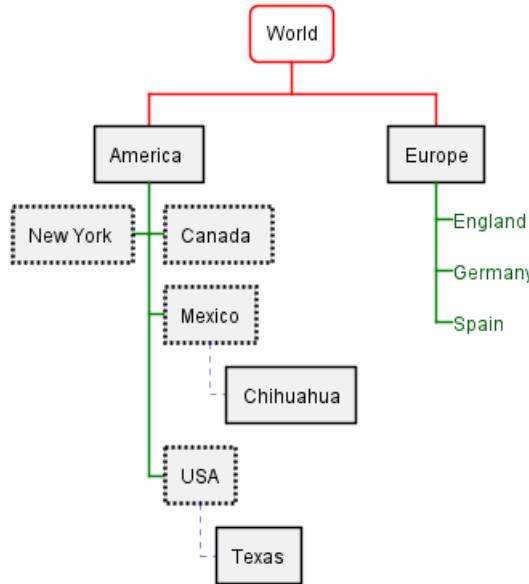
## 18.7 Using style

It is possible to change diagram style.

```
@startwbs
<style>
wbsDiagram {
    // all lines (meaning connector and borders, there are no other lines in WBS) are black by default
    Linecolor black
    arrow {
        // note that connector are actually "arrow" even if they don't look like as arrow
        // This is to be consistent with other UML diagrams. Not 100% sure that it's a good idea
        // So now connector are green
        LineColor green
    }
    :depth(0) {
        // will target root node
        BackgroundColor White
        RoundCorner 10
        LineColor red
        // Because we are targetting depth(0) for everything, border and connector for level 0 will be
    }
    arrow {
        :depth(2) {
            // Targetting only connector between Mexico-Chihuahua and USA-Texas
            LineColor blue
            LineStyle 4
            LineThickness .5
        }
    }
    node {
        :depth(2) {
            LineStyle 2
            LineThickness 2.5
        }
    }
    boxless {
        // will target boxless node with '_'
        FontColor darkgreen
    }
}
</style>
* World
** America
*** Canada
*** Mexico
**** Chihuahua
*** USA
**** Texas
```



```
***< New York
** Europe
***_ England
***_ Germany
***_ Spain
@endwbs
```



## 18.8 Word Wrap

Using `MaximumWidth` setting you can control automatic word wrap. Unit used is pixel.

```
@startwbs
```

```
<style>
node {
    Padding 12
    Margin 3
    HorizontalAlignment center
    LineColor blue
    LineThickness 3.0
    BackgroundColor gold
    RoundCorner 40
    MaximumWidth 100
}

rootNode {
    LineStyle 8.0;3.0
    LineColor red
    BackgroundColor white
    LineThickness 1.0
    RoundCorner 0
    Shadowing 0.0
}

leafNode {
    LineColor gold
    RoundCorner 0
    Padding 3
}
```



```
}
```

```
arrow {
```

```
    LineStyle 4
```

```
    LineThickness 0.5
```

```
    LineColor green
```

```
}
```

```
</style>
```

```
* Hi =)
```

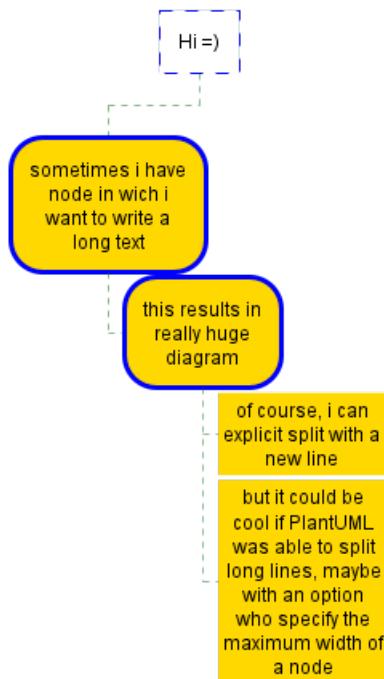
```
** sometimes i have node in which i want to write a long text
```

```
*** this results in really huge diagram
```

```
**** of course, i can explicit split with a\nnew line
```

```
***** but it could be cool if PlantUML was able to split long lines, maybe with an option who specify
```

```
@endwbs
```



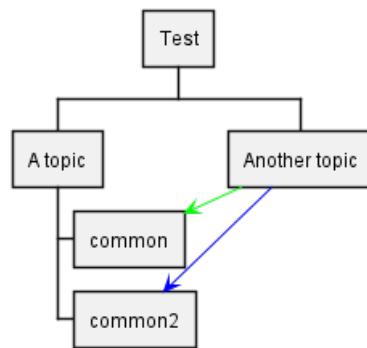
## 18.9 Add arrows between WBS elements

You can add arrows between WBS elements.

Using alias with as:

```
@startwbs
<style>
.foo {
    LineColor #00FF00;
}
</style>
* Test
** A topic
*** "common" as c1
*** "common2" as c2
** "Another topic" as t2
t2 -> c1 <<foo>>
t2 ..> c2 #blue
@endwbs
```

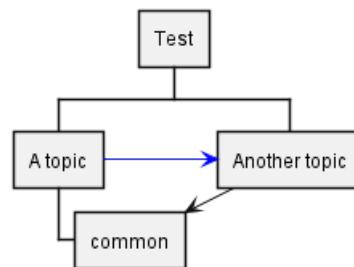




Using alias in parentheses:

```

@startwbs
* Test
**(b) A topic
***(c1) common
**(t2) Another topic
t2 --> c1
b -> t2 #blue
@endwbs
  
```



[Ref. QA-16251]

## 18.10 Creole on WBS diagram

You can use Creole or HTML Creole on WBS:

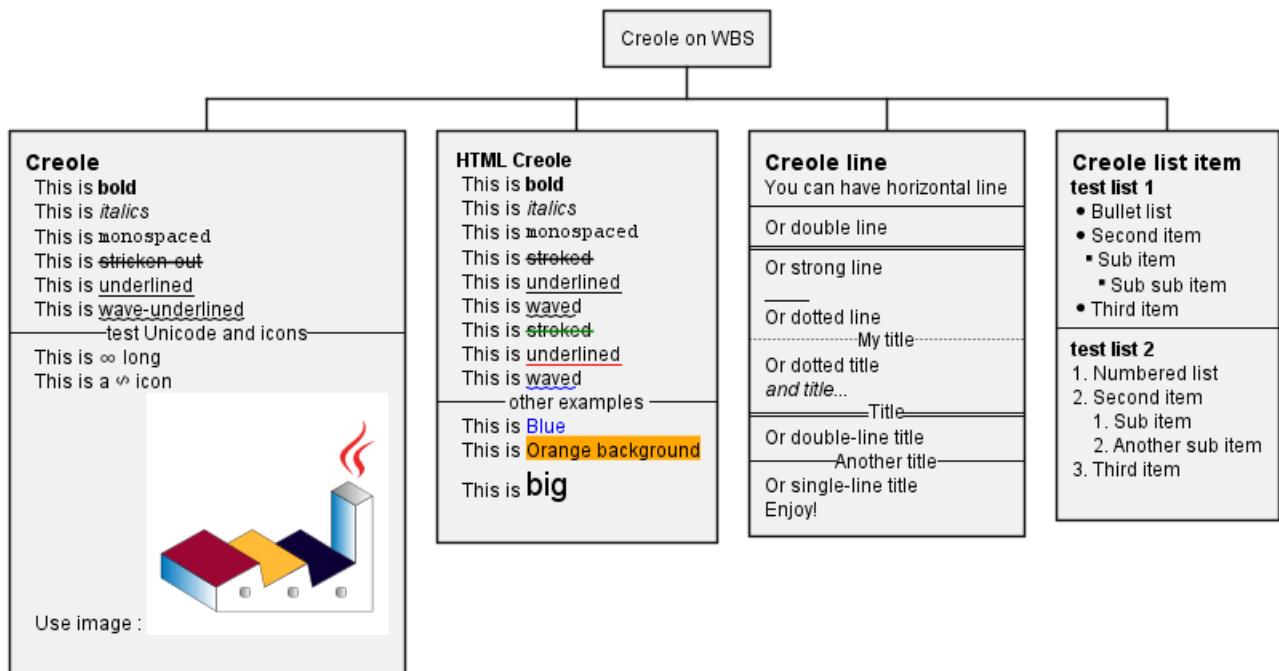
```

@startwbs
* Creole on WBS
**==Creole
  This is **bold**
  This is //italics//
  This is ""monospaced"""
  This is --stricken-out--
  This is __underlined__
  This is ~~wave-underlined~~
--test Unicode and icons--
  This is <U+221E> long
  This is a <&code> icon
  Use image : <img: http://plantuml.com/logo3.png>
;
**: <b>HTML Creole
  This is <b>bold</b>
  This is <i>italics</i>
  This is <font:monospaced>monospaced</font>
  This is <s>stroked</s>
  This is <u>underlined</u>
  This is <w>waved</w>
  
```



```
This is <s:green>stroked</s>
This is <u:red>underlined</u>
This is <w:#0000FF>waved</w>
-- other examples --
This is <color:blue>Blue</color>
This is <back:orange>Orange background</back>
This is <size:20>big</size>
;
**==Creole line
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
Or dotted title
//and title... //
==Title==
Or double-line title
--Another title--
Or single-line title
Enjoy!;
**==Creole list item
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
;
@endwbs
```

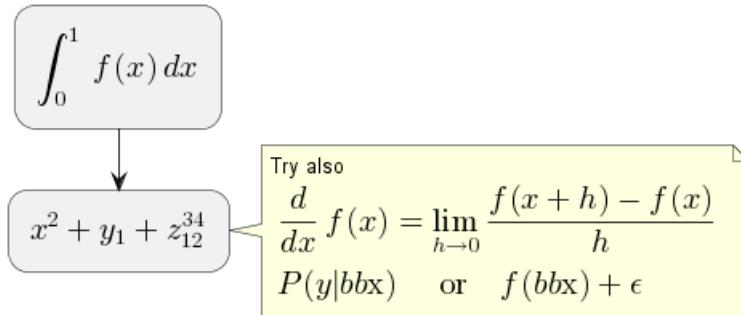




## 19 Maths

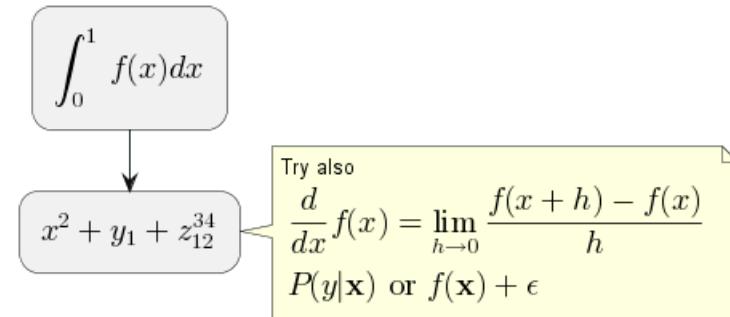
Within PlantUML, you can use AsciiMath notation:

```
@startuml
: $\int_0^1 f(x) dx$ ;
: $x^2 + y_1 + z_{12}^{34}$ ;
note right
Try also
 $d/dx f(x) = \lim_{h \rightarrow 0} (f(x+h) - f(x))/h$ 
 $P(y|bbx)$  or  $f(bbx) + \epsilon$ 
end note
@enduml
```



or JLaTeXMath notation:

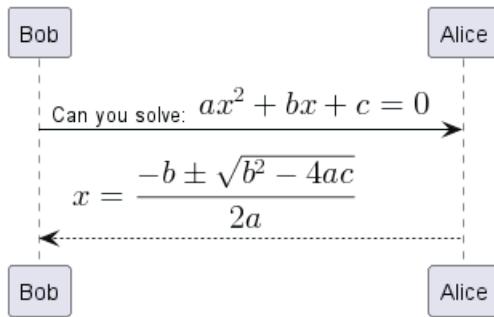
```
@startuml
: $\int_0^1 f(x) dx$ ;
: $x^2 + y_1 + z_{12}^{34}$ ;
note right
Try also
 $\frac{d}{dx} f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ 
 $P(y|\mathbf{x})$  or  $f(\mathbf{x}) + \epsilon$ 
end note
@enduml
```



Here is another example:

```
@startuml
Bob -> Alice : Can you solve:  $ax^2+bx+c=0$ 
Alice --> Bob:  $x = (-b \pm \sqrt{b^2-4ac})/(2a)$ 
@enduml
```





## 19.1 Standalone diagram

You can also use `@startmath/@endmath` to create standalone AsciiMath formula.

```

@startmath
f(t)=(a_0)/2 + sum_{n=1}^oo a_ncos((npit)/L)+sum_{n=1}^oo b_n\ sin((npit)/L)
@endmath
  
```

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\left(\frac{n\pi t}{L}\right) + \sum_{n=1}^{\infty} b_n \sin\left(\frac{n\pi t}{L}\right)$$

Or use `@startlatex/@endlatex` to create standalone JLaTeXMath formula.

```

@startlatex
\sum_{i=0}^{n-1} (a_i + b_i^2)
@endlatex
  
```

$$\sum_{i=0}^{n-1} (a_i + b_i^2)$$

## 19.2 How is this working?

To draw those formulas, PlantUML uses two open source projects:

- AsciiMath that converts AsciiMath notation to LaTeX expression;
- JLatexMath that displays mathematical formulas written in LaTeX. JLaTeXMath is the best Java library to display LaTeX code.

ASCIIMathTeXImg.js is small enough to be integrated into PlantUML standard distribution.

Since JLatexMath is bigger, you have to download it separately, then unzip the 4 jar files (*batik-all-1.7.jar*, *jlatexmath-minimal-1.0.3.jar*, *jlm\_cyrillic.jar* and *jlm\_greek.jar*) in the same folder as PlantUML.jar.



## 20 Entity Relationship Diagram

Based on the Information Engineering notation.

This is an extension to the existing Class Diagram. This extension adds:

- Additional relations for the Information Engineering notation.
- An `entity` alias that maps to the class diagram `class`.
- An additional visibility modifier `*` to identify mandatory attributes.

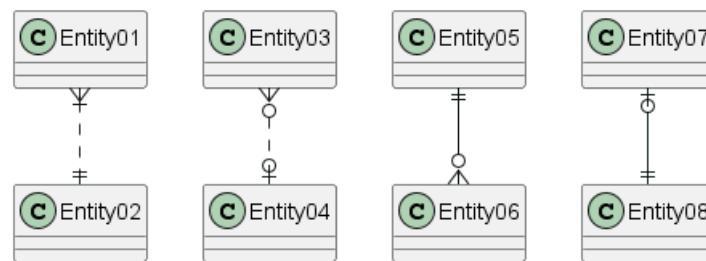
Otherwise, the syntax for drawing diagrams is the same as for class diagrams. All other features of class diagrams are also supported.

### 20.1 Information Engineering Relations

Type	Symbol
Zero or One	o--
Exactly One	--
Zero or Many	}o--
One or Many	} --

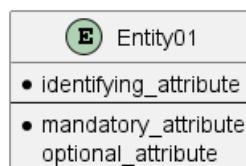
Examples:

```
@startuml
Entity01 }|...|| Entity02
Entity03 }o..o| Entity04
Entity05 ||--o{ Entity06
Entity07 |o--|| Entity08
@enduml
```



### 20.2 Entities

```
@startuml
entity Entity01 {
    * identifying_attribute
    --
    * mandatory_attribute
    optional_attribute
}
@enduml
```

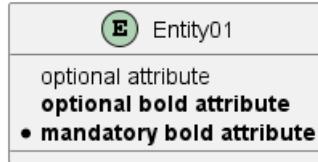


Again, this is the normal class diagram syntax (aside from use of `entity` instead of `class`). Anything that you can do in a class diagram can be done here.



The \* visibility modifier can be used to identify mandatory attributes. A space can be used after the modifier character to avoid conflicts with the creole bold:

```
@startuml
entity Entity01 {
    optional attribute
    **optional bold attribute**
    * **mandatory bold attribute**
}
@enduml
```



## 20.3 Complete Example

```
@startuml

' hide the spot
' hide circle

' avoid problems with angled crows feet
skinparam linetype ortho

entity "Entity01" as e01 {
    *e1_id : number <<generated>>
    --
    *name : text
    description : text
}

entity "Entity02" as e02 {
    *e2_id : number <<generated>>
    --
    *e1_id : number <<FK>>
    other_details : text
}

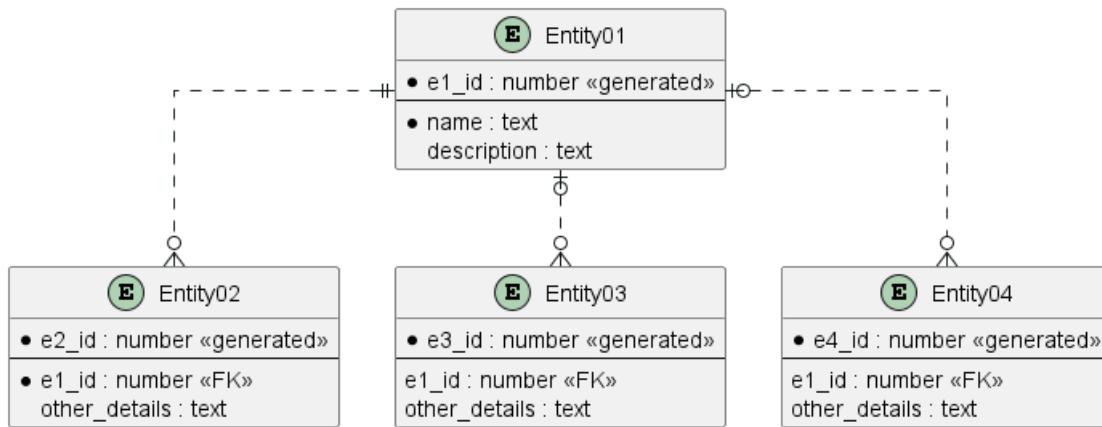
entity "Entity03" as e03 {
    *e3_id : number <<generated>>
    --
    e1_id : number <<FK>>
    other_details : text
}

entity "Entity04" as e04 {
    *e4_id : number <<generated>>
    --
    e1_id : number <<FK>>
    other_details : text
}

e01 ||..o{ e02
e01 |o..o{ e03
e01 |o..o{ e04
```



```
@enduml
```



Currently the crows feet do not look very good when the relationship is drawn at an angle to the entity. This can be avoided by using the `linetype ortho` skinparam.



## 21 Common Commands in PlantUML

Discover the fundamental commands universally applicable across all diagram types in PlantUML. These commands allow you to inject versatility and personalized details into your diagrams. Below, we breakdown these common commands into three major categories:

### 21.0.1 Global Elements

- **Comments:** Add remarks or explanatory notes in your diagram script to convey additional information or to leave reminders for further modifications.
- **Notes:** Incorporate supplementary information directly onto your diagram to aid in understanding or to highlight important aspects.
- **Size Control:** Adjust the dimensions of various elements to suit your preferences, ensuring a balanced and well-proportioned diagram.
- **Title and Captions:** Define a fitting title and add captions to elucidate the context or to annotate specific parts of your diagram.

### 21.0.2 Creole Syntax Description

Harness the power of Creole syntax to further format the content of any element within your diagram. This wiki markup style allows for:

- **Text Formatting:** Customize the appearance of your text with various styles and alignments.
- **Lists:** Create ordered or unordered lists to present information neatly.
- **Links:** Integrate hyperlinks to facilitate quick navigation to relevant resources.

### 21.0.3 Style Control Command

Gain complete control over the presentation style of your diagram elements using the `style` command. Utilize this to:

- **Define Styles:** Set uniform styles for elements to maintain a cohesive visual theme.
- **Customize Colors:** Choose specific colors for various elements to enhance visual appeal and to create distinct classifications.

Explore these commands to create diagrams that are both functional and aesthetically pleasing, tailoring each element to your exact specifications.

## 21.1 Comments

### 21.1.1 Simple comment

Everything that starts with `simple quote '` is a comment.

```
@startuml  
'Line comments use a single apostrophe  
@enduml
```

### 21.1.2 Block comment

Block comment use C-style comments except that instead of `*` you use an apostrophe `',` then you can also put comments on several lines using `/'` to start and `'/` to end.

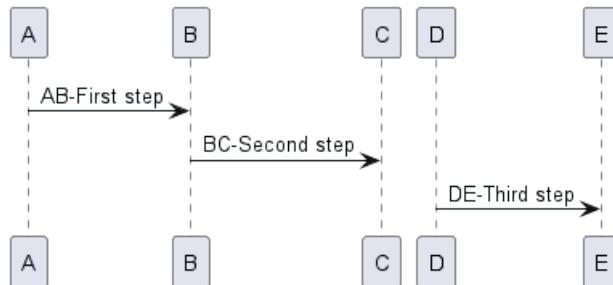
```
@startuml  
/'  
many lines comments  
here  
'/'  
@enduml
```



[Ref. QA-1353]

Then you can also put block comment on the same line, as:

```
@startuml
/* case 1 */
A -> B : AB-First step
B -> C : BC-Second step
/* case 2 */
D -> E : DE-Third step
@enduml
```

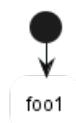


[Ref. QA-3906 and QA-3910]

### 21.1.3 Full example

```
@startuml
skinparam activity {
    ' this is a comment
    BackgroundColor White
    BorderColor Black /* this is a comment */
    BorderColor Red   ' this is not a comment and this line is ignored
}

start
:foo1;
@enduml
```



[Ref. GH-214]

## 21.2 Zoom

You can use the `scale` command to zoom the generated image.

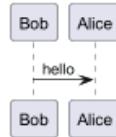
You can use either *a number* or *a fraction* to define the scale factor. You can also specify either `width` or `height` (*in pixel*). And you can also give both `width` and `height`: the image is scaled to fit inside the specified dimension.

- `scale 1.5`
- `scale 2/3`
- `scale 200 width`
- `scale 200 height`
- `scale 200*100`
- `scale max 300*200`
- `scale max 1024 width`



- scale max 800 height

```
@startuml
scale 180*90
Bob->Alice : hello
@enduml
```



### 21.3 Title

The `title` keyword is used to put a title. You can add newline using `\n` in the title description.

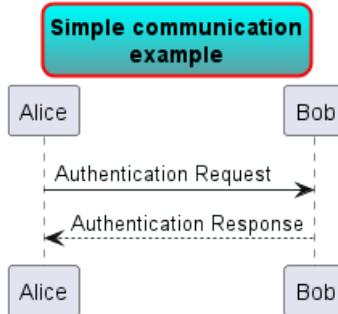
Some `skinparam` settings are available to put borders on the title.

```
@startuml
skinparam titleBorderRoundCorner 15
skinparam titleBorderThickness 2
skinparam titleBorderColor red
skinparam titleBackgroundColor Aqua-CadetBlue

title Simple communication\nexample

Alice -> Bob: Authentication Request
Bob --> Alice: Authentication Response

@enduml
```



You can use creole formatting in the title.

You can also define title on several lines using `title` and `end title` keywords.

```
@startuml

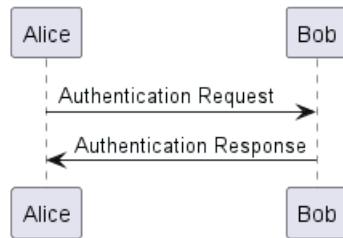
title
<u>Simple</u> communication example
on <i>several</i> lines and using <back:cadetblue>creole tags</back>
end title

Alice -> Bob: Authentication Request
Bob -> Alice: Authentication Response

@enduml
```



**Simple communication example  
on several lines and using creole tags**



## 21.4 Caption

There is also a `caption` keyword to put a caption under the diagram.

```
@startuml
```

```
caption figure 1
Alice -> Bob: Hello
```

```
@enduml
```

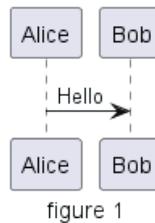


figure 1

## 21.5 Footer and header

You can use the commands `header` or `footer` to add a footer or a header on any generated diagram.

You can optionally specify if you want a `center`, `left` or `right` footer/header, by adding a keyword.

As with title, it is possible to define a header or a footer on several lines.

It is also possible to put some HTML into the header or footer.

```
@startuml
```

```
Alice -> Bob: Authentication Request
```

```
header
```

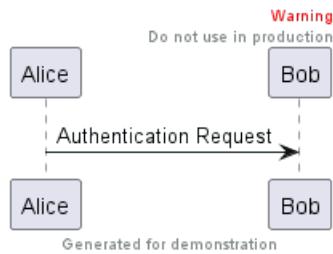
```
<font color=red>Warning:</font>
```

```
Do not use in production.
```

```
endheader
```

```
center footer Generated for demonstration
```

```
@enduml
```

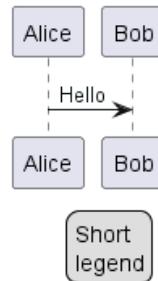


## 21.6 Legend the diagram

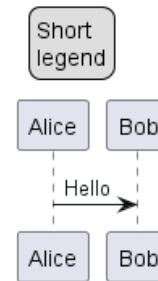
The `legend` and `end legend` are keywords used to put a legend.

You can optionally specify to have `left`, `right`, `top`, `bottom` or `center` alignment for the legend.

```
@startuml
Alice -> Bob : Hello
legend right
Short
legend
endlegend
@enduml
```



```
@startuml
Alice -> Bob : Hello
legend top left
Short
legend
endlegend
@enduml
```



## 21.7 Appendix: Examples on all diagram

### 21.7.1 Activity

```
@startuml
header some header

footer some footer

title My title

caption This is caption

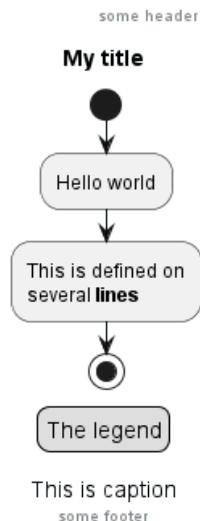
legend
The legend
end legend

start
```



```
:Hello world;
:This is defined on
several **lines**;
stop

@enduml
```



This is caption

some footer

### 21.7.2 Archimate

```
@startuml
header some header

footer some footer

title My title

caption This is caption

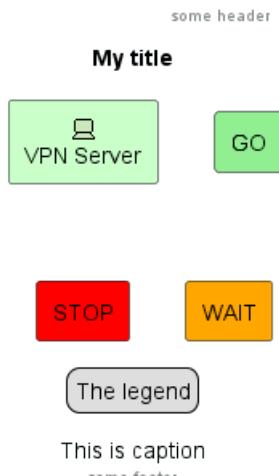
legend
The legend
end legend

archimate #Technology "VPN Server" as vpnServerA <<technology-device>>

rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange

@enduml
```





### 21.7.3 Class

```
@startuml
header some header

footer some footer

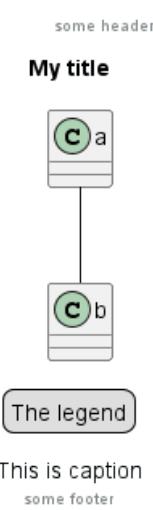
title My title

caption This is caption

legend
The legend
end legend
```

```
a -- b
```

```
@enduml
```



This is caption  
some footer

### 21.7.4 Component, Deployment, Use-Case

```
@startuml
header some header

footer some footer
```



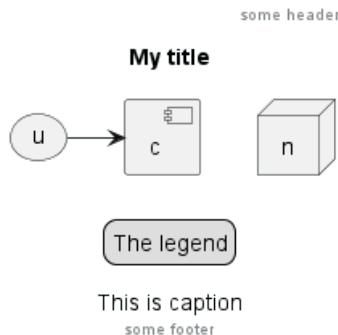
```

title My title
caption This is caption
legend
The legend
end legend

node n
(u) -> [c]

@enduml

```



### 21.7.5 Gantt project planning

```

@startgantt
header some header

footer some footer

title My title
caption This is caption

legend
The legend
end legend

```

[t] lasts 5 days

```

@endgantt

```

some header

**My title**

1	2	3	4	5
t				
1	2	3	4	5

The legend

This is caption  
some footer

**TODO:** DONE *[(Header, footer) corrected on V1.2020.18]*

### 21.7.6 Object

```
@startuml
```

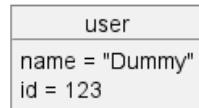
```
header some header
footer some footer
title My title
caption This is caption
legend
The legend
end legend

object user {
    name = "Dummy"
    id = 123
}

@enduml
```

some header

### My title



The legend

This is caption

some footer

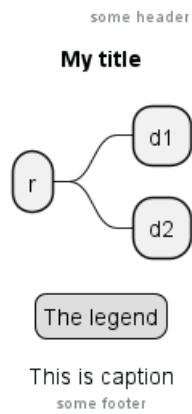
#### 21.7.7 MindMap

```
@startmindmap
header some header
footer some footer
title My title
caption This is caption
legend
The legend
end legend

* r
** d1
** d2

@endmindmap
```





### 21.7.8 Network (nwdiag)

```
@startuml
header some header

footer some footer

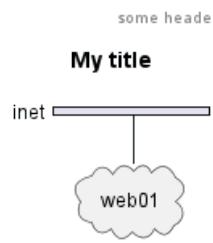
title My title

caption This is caption

legend
The legend
end legend

nwdiag {
    network inet {
        web01 [shape = cloud]
    }
}
```

```
@enduml
```



### 21.7.9 Sequence

```
@startuml
header some header

footer some footer
```



```

title My title
caption This is caption

```

```

legend
The legend
end legend

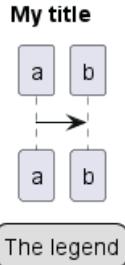
```

```

a->b
@enduml

```

some header



This is caption  
some footer

### 21.7.10 State

```

@startuml
header some header

```

```

footer some footer

```

```

title My title

```

```

caption This is caption

```

```

legend
The legend
end legend

```

```

[*] --> State1
State1 -> State2

```

```

@enduml

```

some header



This is caption  
some footer



### 21.7.11 Timing

```
@startuml
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

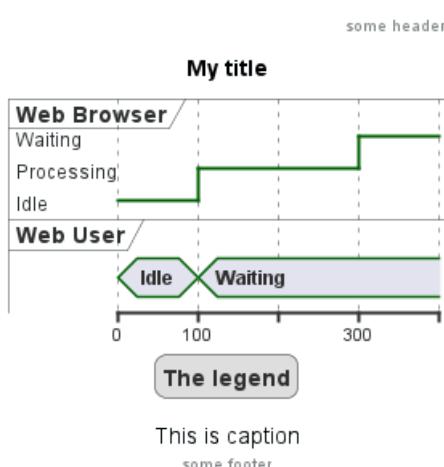
robust "Web Browser" as WB
concise "Web User" as WU

@0
WU is Idle
WB is Idle

@100
WU is Waiting
WB is Processing

@300
WB is Waiting

@enduml
```



### 21.7.12 Work Breakdown Structure (WBS)

```
@startwbs
header some header

footer some footer

title My title

caption This is caption

legend
```



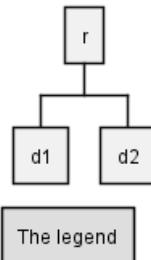
```
The legend
end legend
```

```
* r
** d1
** d2
```

```
@endwbs
```

some header

### My title



The legend

This is caption

some footer

**TODO:** DONE [Corrected on V1.2020.17]

#### 21.7.13 Wireframe (SALT)

```
@startsalt
header some header
```

```
footer some footer
```

```
title My title
```

```
caption This is caption
```

```
legend
```

```
The legend
end legend
```

```
{+
    Login | "MyName"
    Password | "****"
    [Cancel] | [ OK ]
}
@endsalt
```

some header

### My title

Login	<input type="text" value="MyName"/>
Password	<input type="password" value="****"/>
[Cancel]	[OK]

The legend

This is caption

some footer



**TODO:** DONE [Corrected on V1.2020.18]

## 21.8 Appendix: Examples on all diagram with style

**TODO:** DONE

FYI:

- all is only good for **Sequence diagram**
- **title**, **caption** and **legend** are good for all diagrams except for **salt diagram**

**TODO:** FIXME

- Now (*test on 1.2020.18-19*) header, footer are not good for **all other diagrams** except only for **Sequence diagram**.

To be fix; Thanks

**TODO:** FIXME

Here are tests of **title**, **header**, **footer**, **caption** or **legend** on all the diagram with the debug style:

```
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
```

### 21.8.1 Activity

```
@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}
```



```
header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

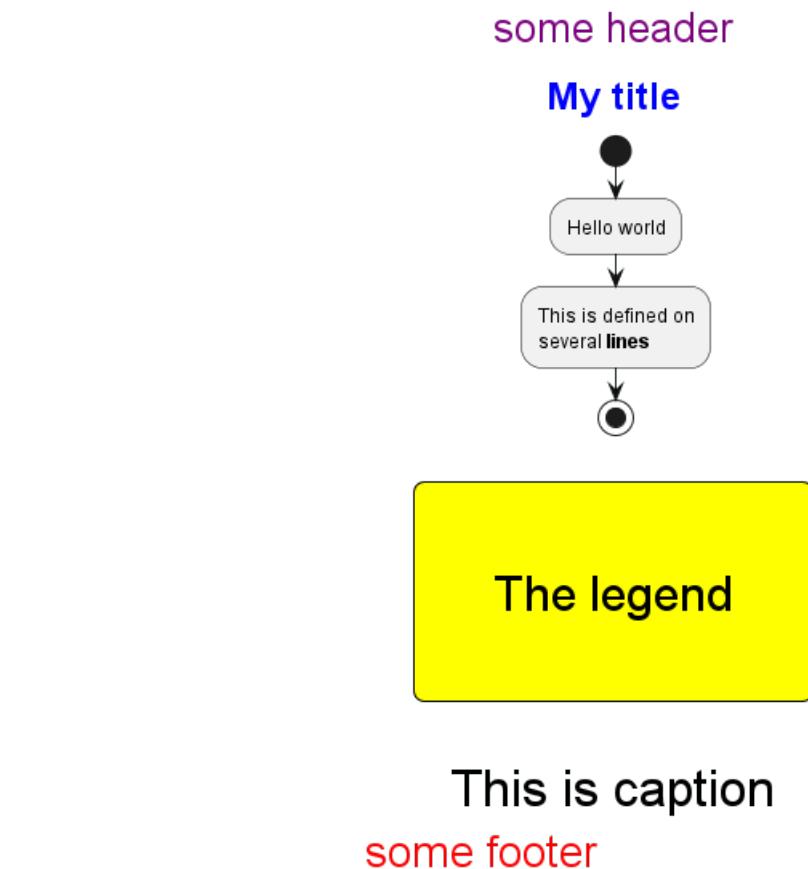
caption This is caption

legend
The legend
end legend

start
:Hello world;
:This is defined on
several **lines**;
stop

@enduml
```





### 21.8.2 Archimate

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

```



```

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

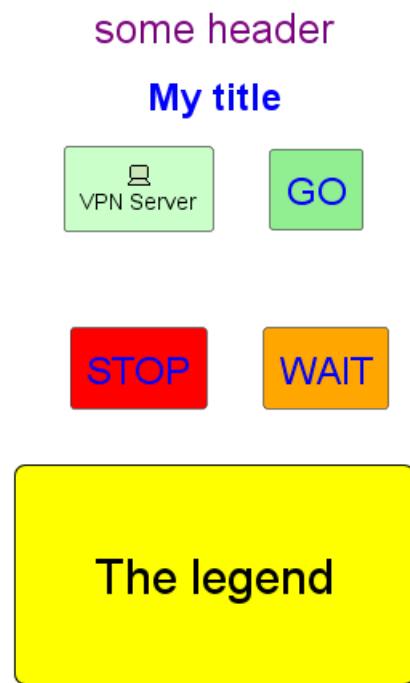
legend
The legend
end legend

archimate #Technology "VPN Server" as vpnServerA <<technology-device>>

rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange

@enduml

```



**This is caption**  
**some footer**

### 21.8.3 Class

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24

```



```
FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

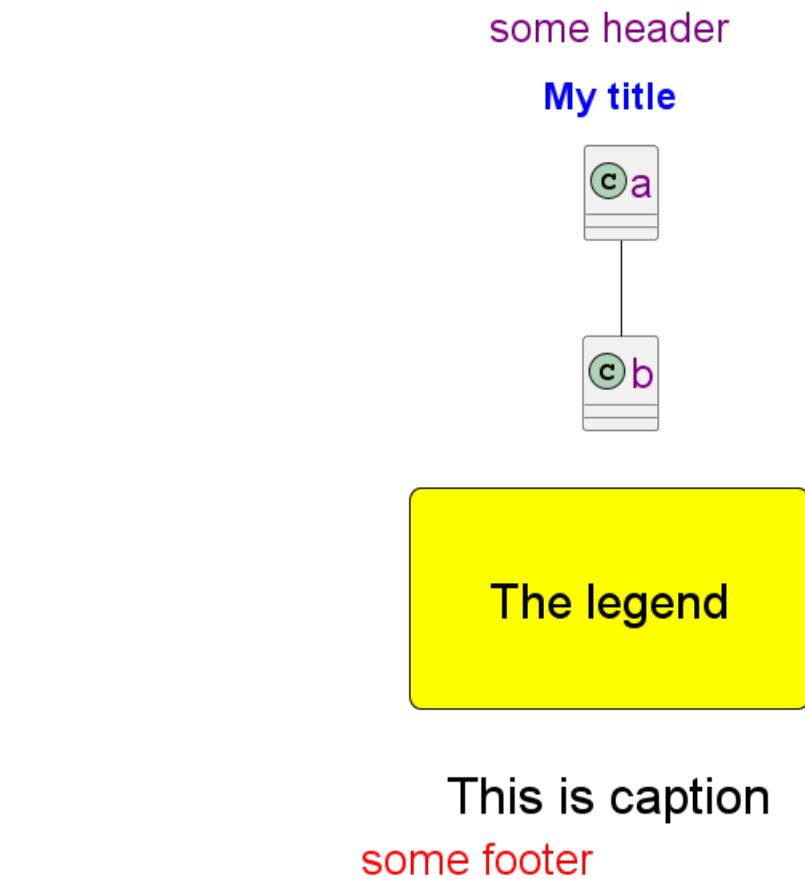
caption This is caption

legend
The legend
end legend

a -- b

@enduml
```





#### 21.8.4 Component, Deployment, Use-Case

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

```

```

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

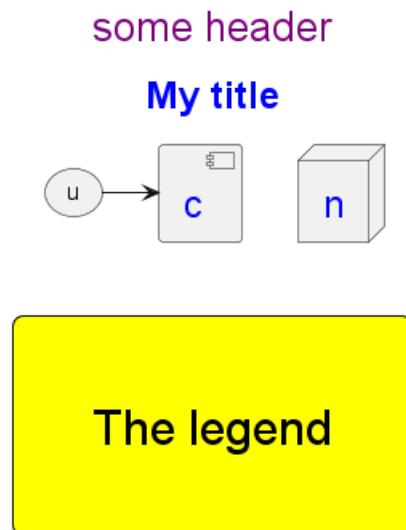
caption This is caption

legend
The legend
end legend

node n
(u) -> [c]

@enduml

```



This is caption  
some footer

#### 21.8.5 Gantt project planning

```

@startgantt
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple

```

```

}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

```

[t] lasts 5 days

@endgantt

some header

**My title**

1	2	3	4	5
t				
1	2	3	4	5

The legend



This is caption

some footer



### 21.8.6 Object

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

object user {
    name = "Dummy"
    id = 123
}

@enduml

```



some header

**My title**

user
name = "Dummy"
id = 123

The legend

This is caption

some footer

#### 21.8.7 MindMap

```
@startmindmap
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header
```



```

footer some footer

title My title

caption This is caption

legend
The legend
end legend

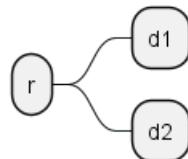
* r
** d1
** d2

@endmindmap

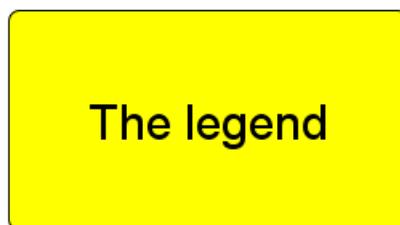
```

some header

**My title**



The legend



This is caption

some footer

#### 21.8.8 Network (nwdiag)

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

```



```
footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

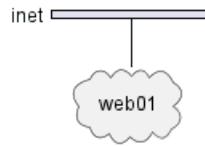
nwdiag {
    network inet {
        web01 [shape = cloud]
    }
}

@enduml
```



some header

## My title



The legend

This is caption

some footer

### 21.8.9 Sequence

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>

```



```

header some header

footer some footer

title My title

caption This is caption

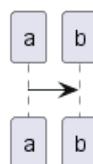
legend
The legend
end legend

a->b
@enduml

```

some header

### My title



The legend

This is caption  
some footer

#### 21.8.10 State

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
}

```



```

FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

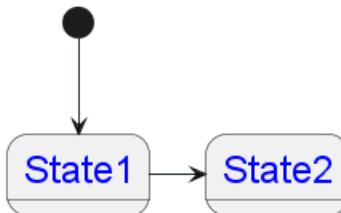
[*] --> State1
State1 -> State2

@enduml

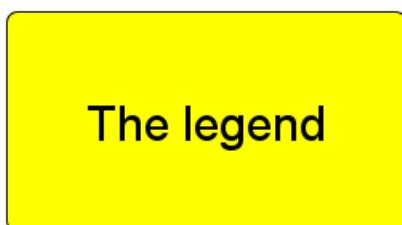
```

some header

**My title**



The legend



This is caption

some footer



### 21.8.11 Timing

```

@startuml
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

robust "Web Browser" as WB
concise "Web User" as WU

@0
WU is Idle
WB is Idle

@100
WU is Waiting
WB is Processing

@300
WB is Waiting

```



@enduml



This is caption  
some footer

### 21.8.12 Work Breakdown Structure (WBS)

```
@startwbs
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}
```



```

caption {
    FontSize 32
}
</style>
header some header

footer some footer

title My title

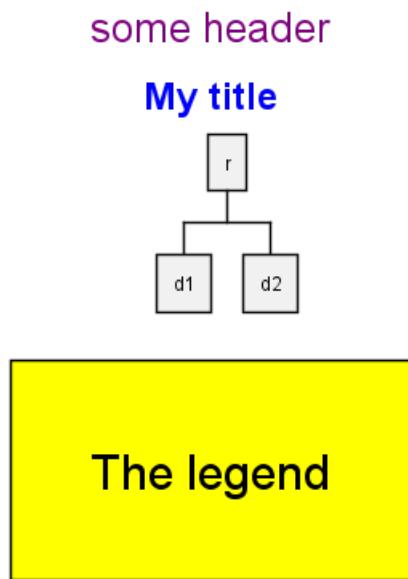
caption This is caption

legend
The legend
end legend

* r
** d1
** d2

@endwbs

```



This is caption  
some footer

### 21.8.13 Wireframe (SALT)

**TODO:**FIXME Fix all (**title**, **caption**, **legend**, **header**, **footer**) for salt. **TODO:**FIXME

```

@startsalt
<style>
title {
    HorizontalAlignment right
    FontSize 24
    FontColor blue
}

```



```

header {
    HorizontalAlignment center
    FontSize 26
    FontColor purple
}

footer {
    HorizontalAlignment left
    FontSize 28
    FontColor red
}

legend {
    FontSize 30
    BackGroundColor yellow
    Margin 30
    Padding 50
}

caption {
    FontSize 32
}
</style>
@startsalt
header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

{+
    Login | "MyName"
    Password | "****"
    [Cancel] | [ OK ]
}
@endsalt
some header

```

**My title**

Login	<input type="text" value="MyName"/>
Password	<input type="password" value="****"/>
[Cancel]	[ OK ]

The legend

This is caption

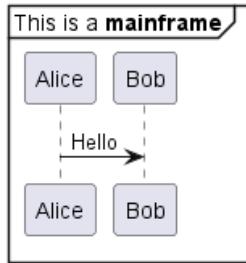
some footer

## 21.9 Mainframe

```
@startuml
mainframe This is a **mainframe**
```



```
Alice->Bob : Hello
@enduml
```



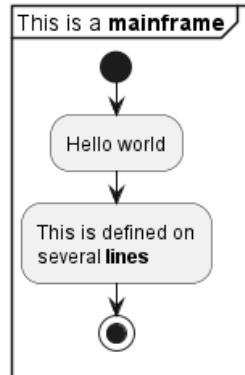
[Ref. QA-4019 and Issue#148]

## 21.10 Appendix: Examples of Mainframe on all diagram

### 21.10.1 Activity

```
@startuml
mainframe This is a **mainframe**

start
:Hello world;
:This is defined on
several **lines**;
stop
@enduml
```

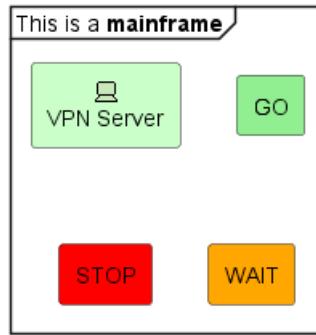


### 21.10.2 Archimate

```
@startuml
mainframe This is a **mainframe**

archimate #Technology "VPN Server" as vpnServerA <<technology-device>>
rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange
@enduml
```





**TODO:**FIXME Cropped on the top and on the left **TODO:**FIXME

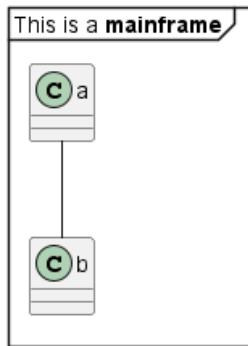
### 21.10.3 Class

```

@startuml
mainframe This is a **mainframe**

a -- b
@enduml

```



**TODO:**FIXME Cropped on the top and on the left **TODO:**FIXME

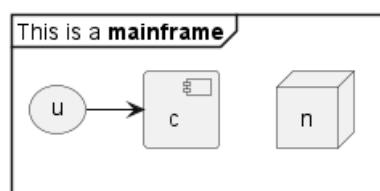
### 21.10.4 Component, Deployment, Use-Case

```

@startuml
mainframe This is a **mainframe**

node n
(u) -> [c]
@enduml

```



**TODO:**FIXME Cropped on the top and on the left **TODO:**FIXME

### 21.10.5 Gantt project planning

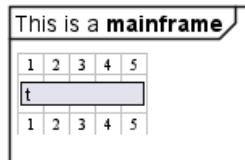
```

@startgantt
mainframe This is a **mainframe**

[t] lasts 5 days
@endgantt

```



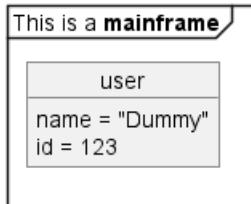


**TODO:**FIXME Cropped on the top and on the left **TODO:**FIXME

### 21.10.6 Object

```
@startuml
mainframe This is a **mainframe**

object user {
    name = "Dummy"
    id = 123
}
@enduml
```

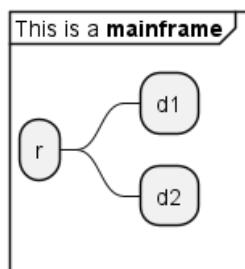


**TODO:**FIXME Cropped on the top! **TODO:**FIXME

### 21.10.7 MindMap

```
@startmindmap
mainframe This is a **mainframe**

* r
** d1
** d2
@endmindmap
```

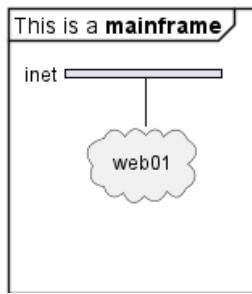


### 21.10.8 Network (nwdiag)

```
@startuml
mainframe This is a **mainframe**

nwdiag {
    network inet {
        web01 [shape = cloud]
    }
}
@enduml
```





**TODO:** FIXME Cropped on the top! **TODO:** FIXME

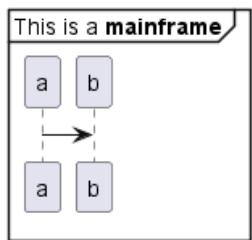
### 21.10.9 Sequence

```

@startuml
mainframe This is a **mainframe**

a->b
@enduml

```



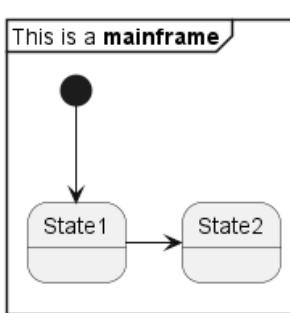
### 21.10.10 State

```

@startuml
mainframe This is a **mainframe**

[*] --> State1
State1 -> State2
@enduml

```



**TODO:** FIXME Cropped on the top and on the left **TODO:** FIXME

### 21.10.11 Timing

```

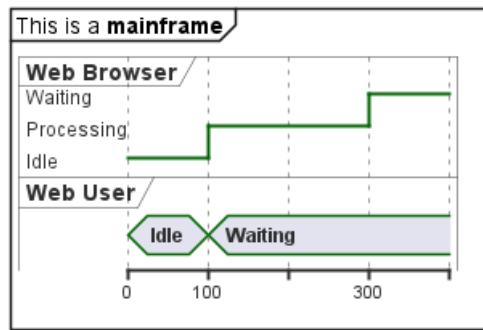
@startuml
mainframe This is a **mainframe**

robust "Web Browser" as WB
concise "Web User" as WU
@0
WU is Idle

```

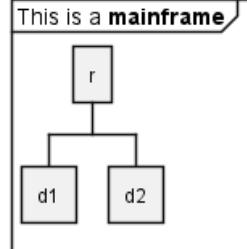


```
WB is Idle
@100
WU is Waiting
WB is Processing
@300
WB is Waiting
@enduml
```



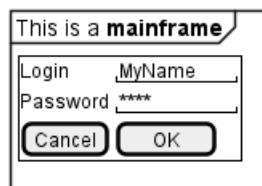
### 21.10.12 Work Breakdown Structure (WBS)

```
@startwbs
mainframe This is a **mainframe**
* r
** d1
** d2
@endwbs
```



### 21.10.13 Wireframe (SALT)

```
@startsalt
mainframe This is a **mainframe**
{+
    Login | "MyName"
    Password | "****"
    [Cancel] | [ OK ]
}
@endsalt
```



## 21.11 Appendix: Examples of title, header, footer, caption, legend and mainframe on all diagram

### 21.11.1 Activity

```
@startuml
mainframe This is a **mainframe**
header some header

footer some footer

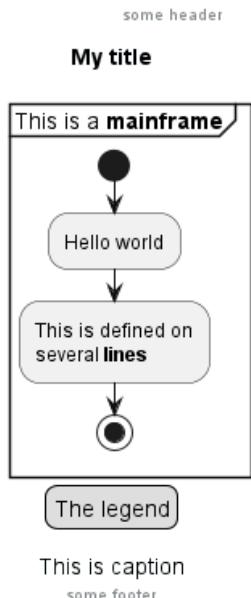
title My title

caption This is caption

legend
The legend
end legend

start
:Hello world;
:This is defined on
several **lines**;
stop

@enduml
```



### 21.11.2 Archimate

```
@startuml
mainframe This is a **mainframe**
header some header

footer some footer

title My title

caption This is caption
```



legend

The legend

end legend

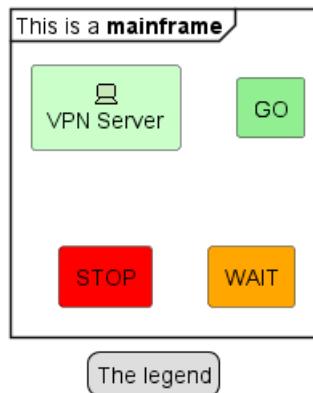
archimate #Technology "VPN Server" as vpnServerA <<technology-device>>

```
rectangle GO #lightgreen
rectangle STOP #red
rectangle WAIT #orange
```

@enduml

some header

### My title



This is caption

some footer

#### 21.11.3 Class

@startuml

```
mainframe This is a **mainframe**
header some header
```

footer some footer

title My title

caption This is caption

legend

The legend

end legend

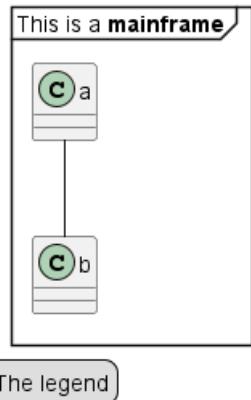
a -- b

@enduml



some header

### My title



This is caption

some footer

#### 21.11.4 Component, Deployment, Use-Case

```
@startuml
mainframe This is a **mainframe**
header some header

footer some footer
```

title My title

caption This is caption

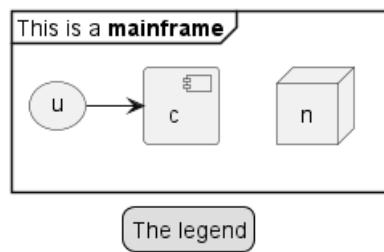
```
legend
The legend
end legend
```

```
node n
(u) -> [c]
```

@enduml

some header

### My title



This is caption

some footer

#### 21.11.5 Gantt project planning

```
@startgantt
mainframe This is a **mainframe**
header some header
```



```

footer some footer

title My title

caption This is caption

```

```

legend
The legend
end legend

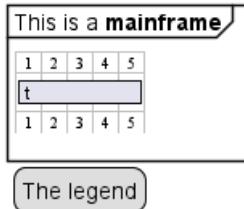
```

```
[t] lasts 5 days
```

```
@enduml
```

some header

### **My title**



The legend

This is caption

some footer

#### 21.11.6 Object

```

@startuml
mainframe This is a **mainframe**
header some header

```

```
footer some footer
```

```
title My title
```

```
caption This is caption
```

```

legend
The legend
end legend

```

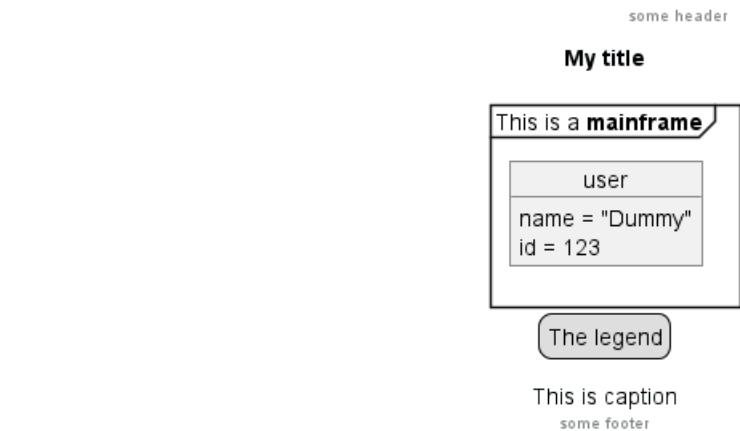
```

object user {
    name = "Dummy"
    id = 123
}

```

```
@enduml
```





### 21.11.7 MindMap

```

@startmindmap
mainframe This is a **mainframe**
header some header

footer some footer

title My title

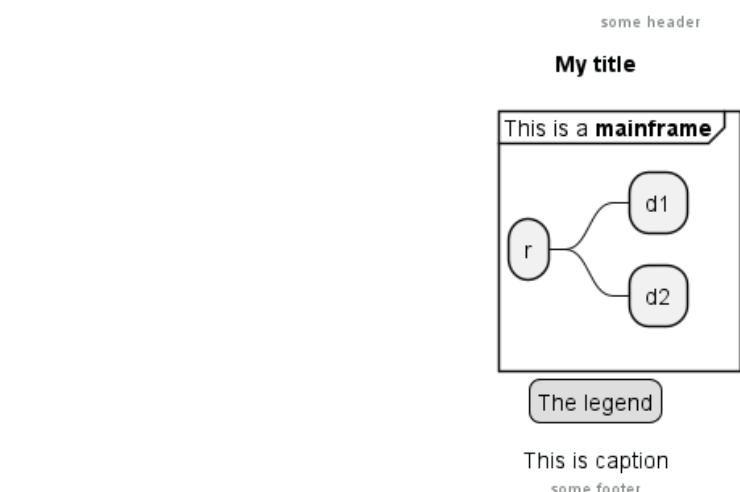
caption This is caption

legend
The legend
end legend

* r
** d1
** d2

@endmindmap

```



### 21.11.8 Network (nwdiag)

```

@startuml
mainframe This is a **mainframe**
header some header

```

```

footer some footer

title My title

caption This is caption

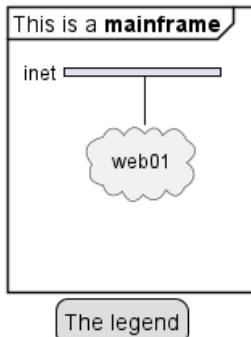
legend
The legend
end legend

nwdiag {
    network inet {
        web01 [shape = cloud]
    }
}

@enduml

```

some header

**My title**

The legend

This is caption

some footer

**21.11.9 Sequence**

```

@startuml
mainframe This is a **mainframe**
header some header

```

footer some footer

title My title

caption This is caption

```

legend
The legend
end legend

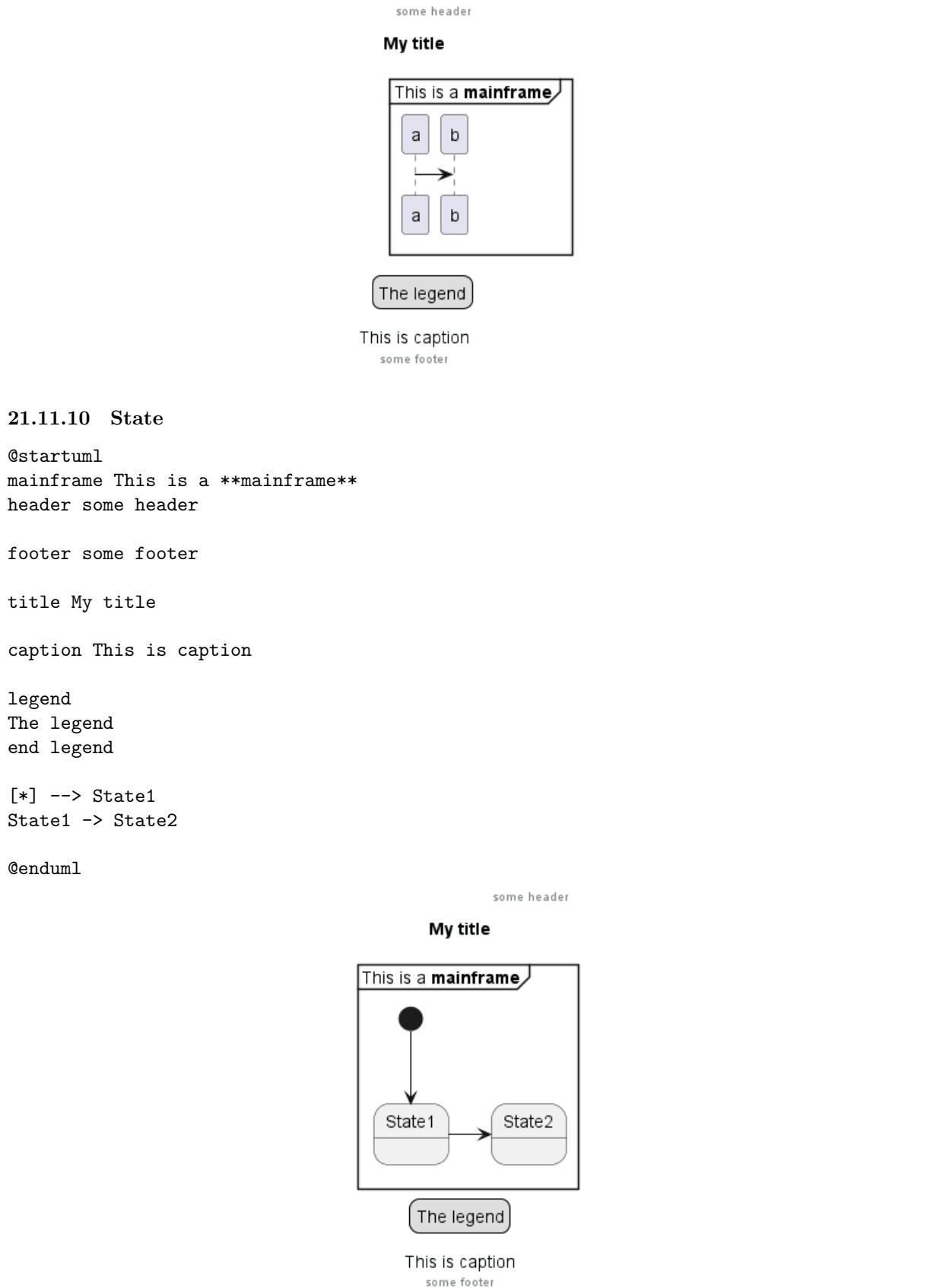
```

```

a->b
@enduml

```





### 21.11.11 Timing

```

@startuml
mainframe This is a **mainframe**

```



```

header some header

footer some footer

title My title

caption This is caption

legend
The legend
end legend

robust "Web Browser" as WB
concise "Web User" as WU

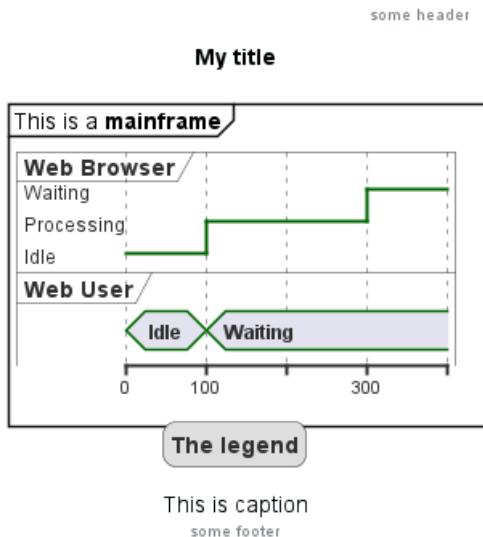
@0
WU is Idle
WB is Idle

@100
WU is Waiting
WB is Processing

@300
WB is Waiting

@enduml

```



This is caption  
some footer

### 21.11.12 Work Breakdown Structure (WBS)

```

@startwbs
mainframe This is a **mainframe**
header some header

footer some footer

title My title

caption This is caption

```



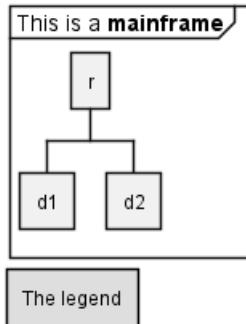
```
legend
The legend
end legend
```

```
* r
** d1
** d2
```

```
@endwbs
```

some header

### My title



This is caption

some footer

#### 21.11.13 Wireframe (SALT)

```
@startsalt
mainframe This is a **mainframe**
header some header
```

```
footer some footer
```

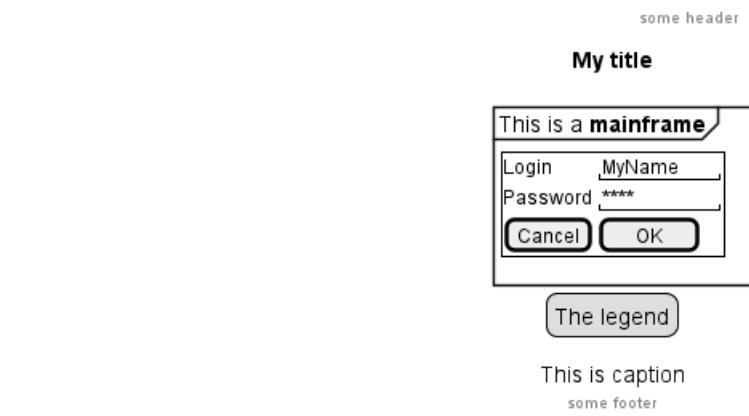
```
title My title
```

```
caption This is caption
```

```
legend
The legend
end legend
```

```
{+
    Login | "MyName"
    Password | "*****"
    [Cancel] | [OK]
}
@endsalt
```





## 22 Creole

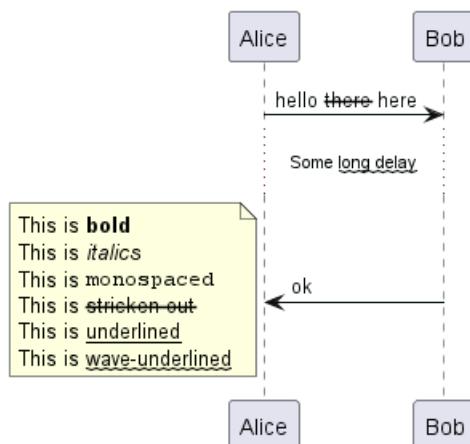
Creole is a lightweight common markup language for various wikis. A light-weight Creole engine is integrated in PlantUML to have a standardized way to emit styled text.

All diagrams support this syntax.

Note that compatibility with HTML syntax is preserved.

### 22.1 Emphasized text

```
@startuml
Alice -> Bob : hello --there-- here
... Some ~~long delay~~ ...
Bob -> Alice : ok
note left
    This is **bold**
    This is //italics//
    This is ""monospaced"""
    This is --stricken-out--
    This is __underlined__
    This is ~~wave-underlined~~
end note
@enduml
```



### 22.2 Lists

You can use numbered and bulleted lists in node text, notes, etc.

**TODO: FIXME** You cannot quite mix numbers and bullets in a list and its sublist.

```
@startuml
object demo {
    * Bullet list
    * Second item
}
note left
    * Bullet list
    * Second item
    ** Sub item
end note
```

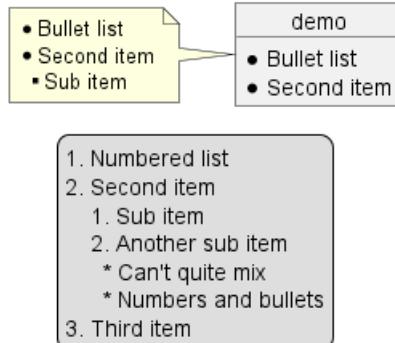
```
legend
# Numbered list
# Second item
## Sub item
```



```

## Another sub item
    * Can't quite mix
    * Numbers and bullets
# Third item
end legend
@enduml

```



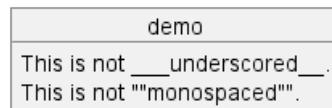
## 22.3 Escape character

You can use the tilde ~ to escape special creole characters.

```

@startuml
object demo {
    This is not ~__underscored__.
    This is not ~""monospaced"".
}
@enduml

```

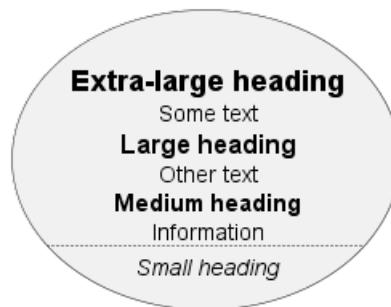


## 22.4 Headings

```

@startuml
usecase UC1 as "
= Extra-large heading
Some text
== Large heading
Other text
==== Medium heading
Information
.....
===== Small heading"
@enduml

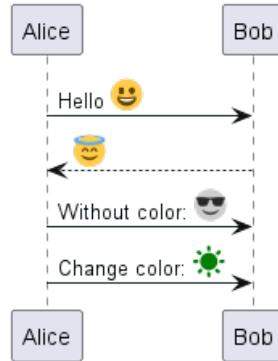
```



## 22.5 Emoji

All emojis from Twemoji (see EmojiTwo on Github) are available using the following syntax:

```
@startuml
Alice -> Bob : Hello <:1f600:>
return <:innocent:>
Alice -> Bob : Without color: <#0:sunglasses:>
Alice -> Bob : Change color: <#green:sunny:>
@enduml
```



Unlike Unicode Special characters that depend on installed fonts, the emoji are always available. Furthermore, emoji are already colored, but you can recolor them if you like (see examples above).

One can pick emoji from the emoji cheat sheet, the Unicode full-emoji-list, or the flat list emoji.txt in the plantuml source.

You can also use the following PlantUML command to list available emoji:

```
@startuml
emoji <block>
@enduml
```

As of 13 April 2023, you can select between 1174 emoji from the following Unicode blocks:

- Unicode block 26: 83 emoji
- Unicode block 27: 33 emoji
- Unicode block 1F3: 246 emoji
- Unicode block 1F4: 255 emoji
- Unicode block 1F5: 136 emoji
- Unicode block 1F6: 181 emoji
- Unicode block 1F9: 240 emoji

### 22.5.1 Unicode block 26

```
@startuml
emoji 26
@enduml
```



### Emoji available on Unicode Block 26

(Blocks available: 26, 27, 1F3, 1F4, 1F5, 1F6, 1F9)

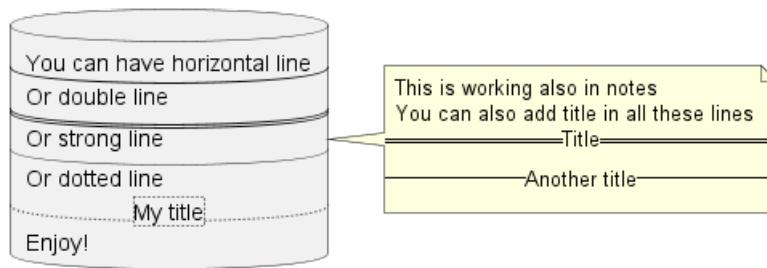
<:2600::> ☀️ ☁️ <:sunny:>	<:264d::> 🌉 🌉 <:virgo:>	<:26aa::> ⚡ ⚡ <:white_circle:>
<:2601::> ☁️ ☁️ <:cloud:>	<:264e::> ♐ ♐ <:libra:>	<:26ab::> ⚫ ⚫ <:black_circle:>
<:2602::> ☂ ☂ <:open_umbrella:>	<:264f::> 🌈 🌈 <:scorpius:>	<:26b0::> 💀 💀 <:coffin:>
<:2603::> 🎅 🎅 <:snowman_with_snow:>	<:2650::> ✸ ✸ <:sagittarius:>	<:26b1::> 💀 💀 <:funeral_urn:>
<:2604::> 🍃 🍃 <:comet:>	<:2651::> 🌊 🌊 <:capricorn:>	<:26b2::> ⚽ ⚽ <:soccer:>
<:260e::> 📞 📞 <:phone:>	<:2652::> 🌊 🌊 <:aquarius:>	<:26be::> ⚾ ⚾ <:baseball:>
<:2611::> ✅ ✅ <:ballot_box_with_check:>	<:2653::> 🌊 🌊 <:pisces:>	<:26c4::> 🎅 🎅 <:snowman:>
<:2614::> ☂ ☂ <:umbrella:>	<:265f::> 🕸️ 🕸️ <:chess_pawn:>	<:26c5::> ☀️ ☁️ <:partly_sunny:>
<:2615::> ☕ ☕ <:coffee:>	<:2660::> ♠️ ♠️ <:spades:>	<:26c8::> ☁️ ☁️ <:cloud_with_lightning_and_rain:>
<:2618::> 🍀 🍀 <:shamrock:>	<:2663::> ♣️ ♣️ <:clubs:>	<:26ce::> 🐍 🐍 <:ophichthus:>
<:261d::> 🤝 🤝 <:point_up:>	<:2665::> ❤️ ❤️ <:hearts:>	<:26cf::> ↗ ↗ <:pick:>
<:2620::> 💀 💀 <:skull_and_crossbones:>	<:2666::> ♦️ ♦️ <:diamonds:>	<:26d1::> 🚒 🚒 <:rescue_worker_helmet:>
<:2622::> ☣ ☣ <:radioactive:>	<:2668::> 💧 💧 <:hotsprings:>	<:26d3::> 🔒 🔒 <:chains:>
<:2623::> ☣ ☣ <:biohazard:>	<:267b::> 🌱 🌱 <:recycle:>	<:26d4::> 🚫 🚫 <:no_entry:>
<:2626::> ✝ ✝ <:orthodox_cross:>	<:267e::> ∞ ∞ <:infinity:>	<:26e9::> 🏮 🏮 <:shinto_shrine:>
<:262a::> ☪ ☪ <:star_and_crescent:>	<:267f::> 🚹 🚹 <:wheelchair:>	<:26ea::> 🏯 🏯 <:church:>
<:262e::> ☮ ☮ <:peace_symbol:>	<:2692::> 🔨 🔨 <:hammer_and_pick:>	<:26f0::> 🏔 🏔 <:mountain:>
<:262f::> ☯ ☯ <:yin_yang:>	<:2693::> 🛜 🛜 <:anchor:>	<:26f1::> ☼ ☼ <:parasol_on_ground:>
<:2638::> ☮ ☮ <:wheel_of_dharma:>	<:2694::> ✕ ✕ <:crossed_swords:>	<:26f2::> 🌿 🌿 <:fountain:>
<:2639::> 😢 😢 <:frowning_face:>	<:2695::> 🌙 🌙 <:medical_symbol:>	<:26f3::> 🏴 🏴 <:golf:>
<:263a::> 😌 😌 <:relaxed:>	<:2696::> 🔠 🔠 <:balance_scale:>	<:26f4::> 🛰 🛰 <:ferry:>
<:2640::> ☵ ☵ <:female_sign:>	<:2697::> 🍷 🍷 <:alembic:>	<:26f5::> 🛳 🛳 <:boat:>
<:2642::> ☶ ☶ <:male_sign:>	<:2699::> 🛡 🛡 <:gear:>	<:26f7::> 🛹 🛹 <:skier:>
<:2648::> ☊ ☊ <:aries:>	<:269b::> ☣ ☣ <:atom_symbol:>	<:26f8::> 🎩 🎩 <:ice_skate:>
<:2649::> ☊ ☊ <:taurus:>	<:269c::> ☔ ☔ <:fleur_de_lis:>	<:26f9::> 🎈 🎈 <:bouncing_ball_person:>
<:264a::> ☊ ☊ <:gemini:>	<:26a0::> ⚠️ ⚠️ <:warning:>	<:26fa::> ☺ ☺ <:tent:>
<:264b::> ☊ ☊ <:cancer:>	<:26a1::> ⚡ ⚡ <:zap:>	<:26fd::> 🛢 🛢 <:fuelpump:>
<:264c::> ☊ ☊ <:leo:>	<:26a7::> ☔ ☔ <:transgender_symbol:>	

## 22.6 Horizontal lines

```
@startuml
database DB1 as "
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
Enjoy!
"
note right
    This is working also in notes
    You can also add title in all these lines
    ==Title==
    --Another title--
end note

@enduml
```





## 22.7 Links

You can also use URL and links.

Simple links are define using two square brackets (or three square brackets for field or method on class diagram).

Example:

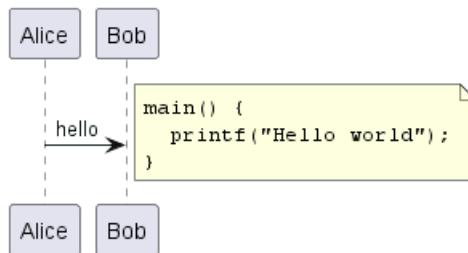
- [[http://plantuml.com]]
- [[http://plantuml.com This label is printed]]
- [[http://plantuml.com{Optional tooltip} This label is printed]]

URL can also be authenticated.

## 22.8 Code

You can use `<code>` to display some programming code in your diagram (sorry, syntax highlighting is not yet supported).

```
@startuml
Alice -> Bob : hello
note right
<code>
main() {
    printf("Hello world");
}
</code>
end note
@enduml
```



This is especially useful to illustrate some PlantUML code and the resulting rendering:

```
@startuml
hide footbox
note over Source
<code>
This is **bold**
This is //italics//
This is ""monospaced"""
This is --stricken-out--
This is __underlined__

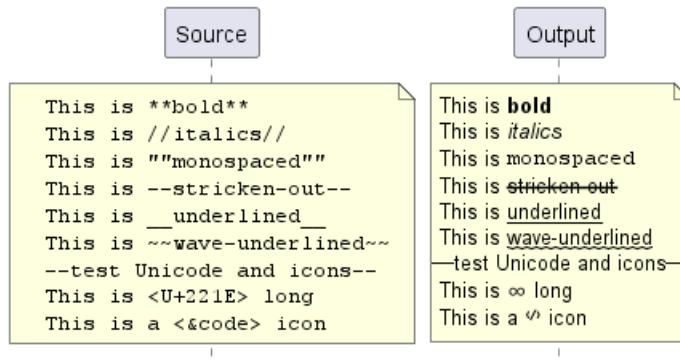
```



```

This is ~~wave-underlined~~
--test Unicode and icons--
This is <U+221E> long
This is a <&code> icon
</code>
end note
/note over Output
This is **bold**
This is //italics//
This is ""monospaced"""
This is --stricken-out--
This is __underlined__
This is ~~wave-underlined~~
--test Unicode and icons--
This is <U+221E> long
This is a <&code> icon
end note
@enduml

```



## 22.9 Table

### 22.9.1 Create a table

It is possible to build table, with | separator.

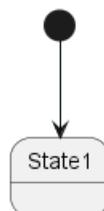
```

@startuml
skinparam titleFontSize 14
title
Example of simple table
|= |= table |= header |
| a | table | row |
| b | table | row |
end title
[*] --> State1
@enduml

```

Example of simple table

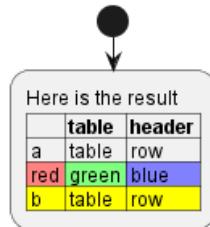
table	header
a	row
b	row



### 22.9.2 Add color on rows or cells

You can specify background colors of rows and cells:

```
@startuml
start
:Here is the result
|= |= table |= header |
| a | table | row |
|<#FF8080> red |<#80FF80> green |<#8080FF> blue |
<#yellow>| b | table | row |
@enduml
```



### 22.9.3 Add color on border and text

You can also specify colors of text and borders.

```
@startuml
title
<#lightblue,#red>|= Step |= Date |= Name |= Status |= Link |
<#lightgreen>| 1.1 | TBD | plantuml news |<#Navy><color:OrangeRed><b> Unknown | [[https://plantuml.com]]
end title
@enduml
```

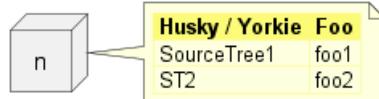
Step	Date	Name	Status	Link
1.1	TBD	plantuml news	Unknown	plantuml news

[Ref. QA-7184]

### 22.9.4 No border or same color as the background

You can also set the border color to the same color as the background.

```
@startuml
node n
note right of n
<#FBFB77,#FBFB77>|= Husky / Yorkie |= Foo |
| SourceTree1 | foo1 |
| ST2 | foo2 |
end note
@enduml
```



[Ref. QA-12448]

### 22.9.5 Bold header or not

= as the first char of a cell indicates whether to make it bold (usually used for headers), or not.



```

@startuml
note as deepCSS0
|<#white> Husky / Yorkie |
|= <#gainsboro> SourceTree0 |
endnote

note as deepCSS1
|= <#white> Husky / Yorkie |= Foo |
|<#gainsboro><r> SourceTree1 | foo1 |
endnote

note as deepCSS2
|= Husky / Yorkie |
|<#gainsboro> SourceTree2 |
endnote

note as deepCSS3
<#white>|= Husky / Yorkie |= Foo |
|<#gainsboro> SourceTree1 | foo1 |
endnote
@enduml

```



[Ref. QA-10923]

## 22.10 Tree

You can use `|_` characters to build a tree.

On common commands, like title:

```

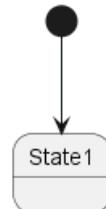
@startuml
skinparam titleFontSize 14
title
    Example of Tree
    |_ First line
    |_ **Bom (Model)**
        |_ prop1
        |_ prop2
        |_ prop3
    |_ Last line
end title
[*] --> State1
@enduml

```



**Example of Tree**

- First line
- Bom (Model)
- prop1
- prop2
- prop3
- Last line



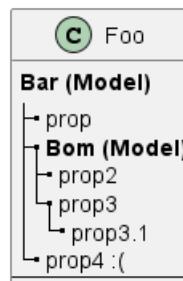
On Class diagram.

(Please note how we have to use an empty second compartment, else the parentheses in **(Model)** cause that text to be moved to a separate first compartment):

```

@startuml
class Foo {
**Bar (Model)**
|_ prop
|_ **Bom (Model)**
|_ prop2
|_ prop3
|_ prop3.1
|_ prop4 :(
-- 
}
@enduml

```



[Ref. QA-3448]

On Component or Deployment diagrams:

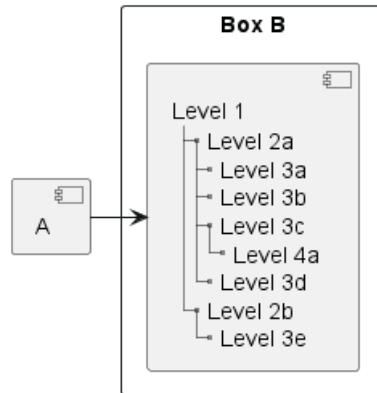
```

@startuml
[A] as A
rectangle "Box B" {
    component B [
        Level 1
        |_ Level 2a
        |_ Level 3a
        |_ Level 3b
        |_ Level 3c
        |_ Level 4a
        |_ Level 3d
        |_ Level 2b
        |_ Level 3e
    ]
}

```



```
]
}
A -> B
@enduml
```

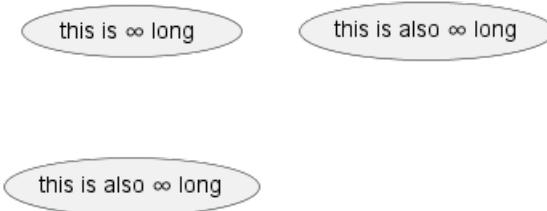


[Ref. QA-11365]

## 22.11 Special characters

It's possible to use any unicode character, either directly or with syntax `&#nnnnnn;` (decimal) or `<U+XXXXXX>` (hex):

```
@startuml
usecase direct as "this is & long"
usecase ampHash as "this is also & long"
usecase angleBrackets as "this is also <U+221E> long"
@enduml
```



Please note that not all Unicode chars appear correctly, depending on installed fonts.

- You can use the listfonts command with a test string of your desired characters, to see which fonts may include them.
- For characters that are emoji, it's better to use the Emoji notation that doesn't depend on installed fonts, and the emoji are colored.
- The PlantUML server has the "Noto Emoji" font that has most emoji. If you want to render diagrams on your local system, you should check which fonts you have.
- Unfortunately "Noto Emoji" lacks normal chars, so you need to switch fonts, eg

```
@startuml
rectangle "<font:Noto Emoji><U+1F3F7></font> label"
rectangle "<font:Noto Emoji><U+1F527></font> wrench"
rectangle "<font:Noto Emoji><U+1F6E0></font> hammer_and_wrench"
@enduml
```





See Issue 72 for more details.

## 22.12 Legacy HTML

You can mix Creole with the following HTML tags:

- <b> for bold text
- <u> or <u:#AAAAAA> or <u: [[color|colorName]]> for underline
- <i> for italic
- <s> or <s:#AAAAAA> or <s: [[color|colorName]]> for strike text
- <w> or <w:#AAAAAA> or <w: [[color|colorName]]> for wave underline text
- <plain> for plain text
- <color:#AAAAAA> or <color: [[color|colorName]]>
- <back:#AAAAAA> or <back: [[color|colorName]]> for background color
- <size:nn> to change font size
- <img:file> : the file must be accessible by the filesystem
- <img:http://plantuml.com/logo3.png> : the URL must be available from the Internet

```
@startuml
/* You can change <color:red>text color</color>
 * You can change <back:cadetblue>background color</back>
 * You can change <size:18>size</size>
 * You use <u>legacy</u> <b>HTML <i>tag</i></b>
 * You use <u:red>color</u> <s:green>in HTML</s> <w:#0000FF>tag</w>
-----
* Use image : <img:http://plantuml.com/logo3.png>
;
@enduml
```

- You can change text color
- You can change background color
- You can change size
- You use legacy HTML tag
- You use color in HTML tag



• Use image :



### 22.12.1 Common HTML element

```

@startuml
hide footbox
note over Source
<code>
This is <b>bold</b>
This is <i>italics</i>
This is <font:monospaced>monospaced</font>
This is <s>stroked</s>
This is <u>underlined</u>
This is <w>waved</w>
This is <s:green>stroked</s>
This is <u:red>underlined</u>
This is <w:#0000FF>waved</w>
This is <b>a bold text containing <plain>plain text</plain> inside</b>
-- other examples --
This is <color:blue>Blue</color>
This is <back:orange>Orange background</back>
This is <size:20>big</size>
</code>
end note
/note over Output
This is <b>bold</b>
This is <i>italics</i>
This is <font:monospaced>monospaced</font>
This is <s>stroked</s>
This is <u>underlined</u>
This is <w>waved</w>
This is <s:green>stroked</s>
This is <u:red>underlined</u>
This is <w:#0000FF>waved</w>
This is <b>a bold text containing <plain>plain text</plain> inside</b>
-- other examples --
This is <color:blue>Blue</color>
This is <back:orange>Orange background</back>
This is <size:20>big</size>
end note
@enduml

```



[Ref. QA-5254 for `plain`]



### 22.12.2 Subscript and Superscript element [sub, sup]

```
@startuml
:<code>
This is the "caffeine" molecule: C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>
</code>
This is the "caffeine" molecule: C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>
-----
<code>
This is the Pythagorean theorem: a<sup>2</sup> + b<sup>2</sup> = c<sup>2</sup>
</code>
This is the Pythagorean theorem: a<sup>2</sup> + b<sup>2</sup> = c<sup>2</sup>;
@enduml
```

This is the "caffeine" molecule: C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>  
 This is the "caffeine" molecule: C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>

This is the Pythagorean theorem: a<sup>2</sup> + b<sup>2</sup> = c<sup>2</sup>  
 This is the Pythagorean theorem: a<sup>2</sup> + b<sup>2</sup> = c<sup>2</sup>

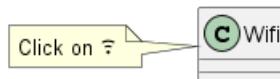
## 22.13 OpenIconic

OpenIconic is a very nice open-source icon set. Those icons are integrated in the creole parser, so you can use them out-of-the-box.

Use the following syntax: <&ICON\_NAME>.

```
@startuml
title: <size:20><&heart>Use of OpenIconic<&heart></size>
class Wifi
note left
  Click on <&wifi>
end note
@enduml
```

### ♥Use of OpenIconic♥



The complete list is available with the following special command:

```
@startuml
listopeniconic
@enduml
```



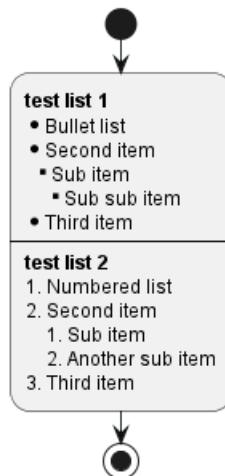
<b>List Open Iconic</b>	◆ bell	◆ cloud	≡ excerpt	≡ justify-right	♪ musical-note	★ star
Credit to <a href="https://useiconic.com/open">https://useiconic.com/open</a>	✿ bluetooth	▲ cloudy	Ξ expand-down	❖ key	☛ paperclip	☀ sun
B bold	▷ code	▷ expand-left	▷ expand-right	▢ laptop	❖ pencil	▢ tablet
✚ bolt	❖ cog	▷ collapse-down	▷ collapse-left	▢ layers	❖ people	❖ tag
↯ account-login	■ book	▷ collapse-right	▷ collapse-up	❖ lightbulb	❖ person	❖ tags
↯ account-logout	■ bookmark	▷ collapse-up	▷ external-link	▷ link-broken	▢ phone	◎ target
↶ action-redo	■ box	▷ command	❖ eye	▷ link-intact	❖ pie-chart	☒ task
↶ action-undo	■ briefcase	■ comment-square	❖ file	■ list-rich	✚ pin	▣ terminal
≡ align-center	£ british-pound	❖ compass	❖ fire	≡ list	● play-circle	TeX
≡ align-left	▢ browser	❖ contrast	❖ flag	◀ location	+ plus	☛ thumb-down
≡ align-right	✓ brush	❖ copywriting	❖ flash	❖ lock-locked	○ power-standby	◀ thumb-up
✖ aperture	✿ bug	■ credit-card	❖ folder	❖ lock-unlocked	✖ print	⌚ timer
↓ arrow-bottom	✿ bullhorn	❖ crop	❖ fork	❖ loop-circular	▷ project	☒ transfer
○ arrow-circle-bottom	■ calculator	❖ dashboard	❖ globe	❖ loop-square	❖ pulse	❖ trash
○ arrow-circle-left	■ calendar	▷ caret-bottom	❖ graph	❖ loop	❖ puzzle-piece	❖ underline
○ arrow-circle-right	✿ camera-slr	◀ caret-left	❖ grid-four-up	❖ magnifying-glass	? question-mark	▣ vertical-align-bottom
○ arrow-circle-top	▼ caret-right	❖ delete	❖ grid-three-up	❖ map-marker	❖ rain	▣ vertical-align-center
→ arrow-left	▲ caret-top	❖ dial	❖ grid-two-up	❖ map	✖ random	▣ vertical-align-top
→ arrow-right	✖ cart	❖ document	❖ hard-drive	▷ media-pause	❖ resize-both	❖ volume-high
↓ arrow-thick-bottom	✿ chat	✿ dollar	❖ header	▶ media-play	❖ resize-height	❖ volume-low
← arrow-thick-left	✓ check	” double-quote-sans-left	❖ headphones	● media-record	❖ resize-width	❖ volume-off
→ arrow-thick-left	▼ chevron-bottom	” double-quote-sans-right	❖ heart	◀ media-skip-backward	❖ rss-alt	⚠ warning
→ arrow-thick-right	◀ chevron-left	” double-quote-serif-left	❖ home	▶ media-skip-forward	❖ rss	❖ wifi
↑ arrow-thick-top	▶ chevron-right	” double-quote-serif-right	❖ image	◀ media-step-backward	❖ script	❖ wrench
↑ arrow-top	✖ chevron-top	❖ droplet	❖ inbox	▶ media-step-forward	❖ share-boxed	✖ x
❖ audio-spectrum	○ circle-check	▲ eject	❖ infinity	■ media-stop	❖ share	¥ yen
“ audio	○ circle-x	❖ elevator	❖ info	❖ medical-cross	❖ shield	❖ zoom-in
❖ badge	■ clipboard	” ellipses	❖ italic	≡ menu	❖ signal	❖ zoom-out
○ ban	○ clock	■ envelope-closed	❖ justfy-center	❖ microphone	↑ signpost	❖ sort-ascending
❖ bar-chart	▲ cloud-download	■ envelope-open	❖ justfy-left	— minus	❖ sort-descending	❖ sort-descending
❖ basket	✿ cloud-upload	€ euro	❖ justfy-right	❖ monitor	■ spreadsheet	
❖ battery-empty				❖ moon		
❖ battery-full				❖ move		
❖ beaker						

## 22.14 Appendix: Examples of "Creole List" on all diagrams

### 22.14.1 Activity

```
@startuml
start
:**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item;
stop
@enduml
```





### 22.14.2 Class

**TODO:** FIXME

- *Sub item*
- *Sub sub item*

**TODO:** FIXME

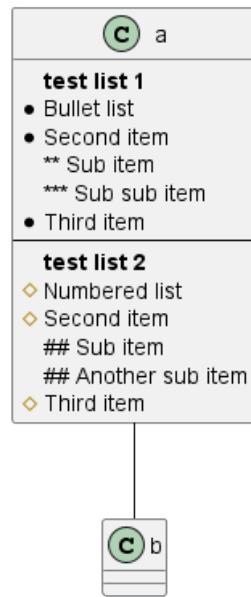
```
@startuml
```

```
class a {
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
}
```

```
a -- b
```

```
@enduml
```





### 22.14.3 Component, Deployment, Use-Case

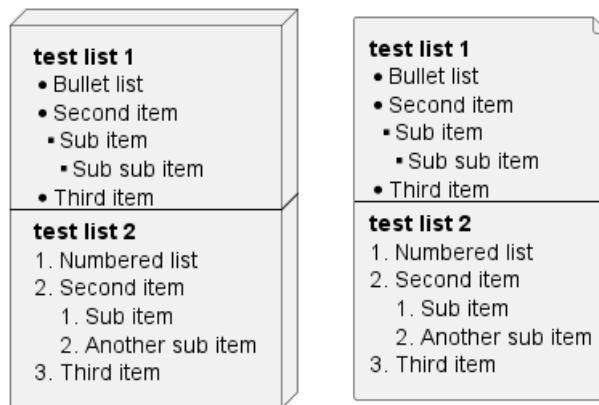
```

@startuml
node n [
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
]

file f as "
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
"
@enduml

```





**TODO:** DONE [Corrected in V1.2020.18]

#### 22.14.4 Gantt project planning

N/A

#### 22.14.5 Object

**TODO:** FIXME

- *Sub item*
- *Sub sub item*

**TODO:** FIXME

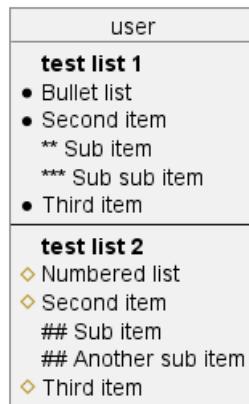
```

@startuml
object user {
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
}

```

@enduml





#### 22.14.6 MindMap

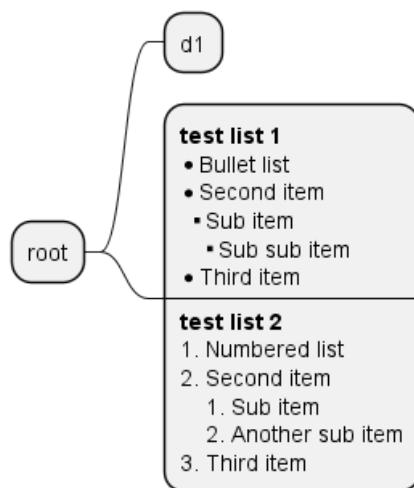
```

@startmindmap

* root
** d1
**:**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item;

```

```
@endmindmap
```



#### 22.14.7 Network (nwdiag)

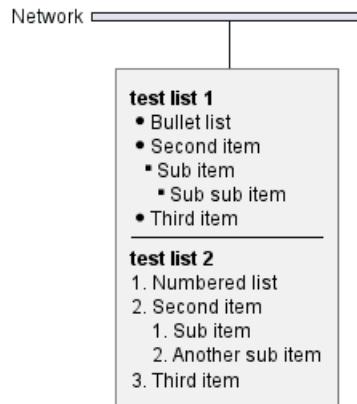
```

@startuml
nwdiag {

```

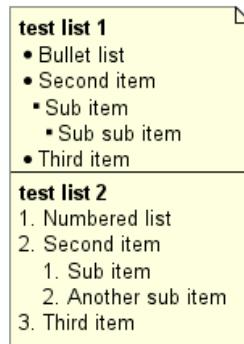


```
network Network {
    Server [description="**test list 1**\n* Bullet list\n* Second item\n** Sub item\n*** Sub sub i
}
@enduml
```



#### 22.14.8 Note

```
@startuml
note as n
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
end note
@enduml
```



#### 22.14.9 Sequence

```
@startuml
<style>
participant {HorizontalAlignment left}
</style>
```



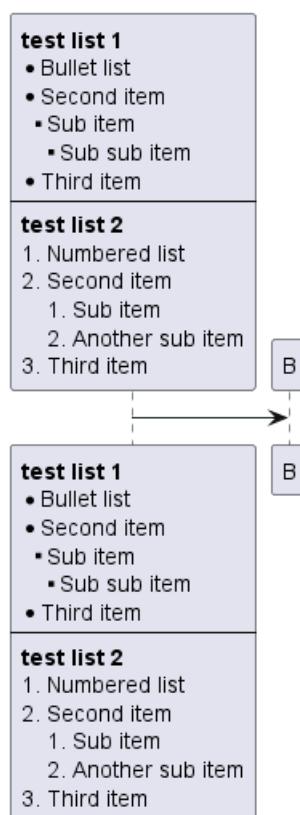
```

participant Participant [
**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item
]

participant B

```

Participant -> B  
@enduml



[Ref. QA-15232]

#### 22.14.10 State

```

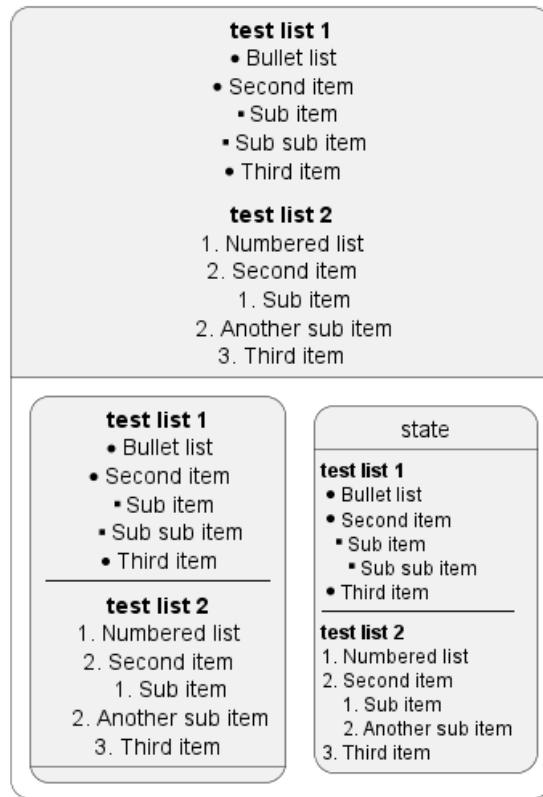
@startuml
<style>
stateDiagram {
title {HorizontalAlignment left}
}
</style>
state "***test list 1**\n* Bullet list\n* Second item\n** Sub item\n*** Sub sub item\n* Third item\n--"
state "***test list 1**\n* Bullet list\n* Second item\n** Sub item\n*** Sub sub item\n* Third item\n--"

```



```
state : **test list 1**\n* Bullet list\n* Second item\n** Sub item\n*** Sub sub item\n* Third item\n}
```

@enduml



[Ref. QA-16978]

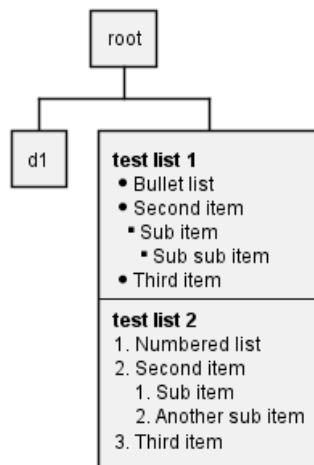
#### 22.14.11 WBS

@startwbs

```
* root
** d1
**:**test list 1**
* Bullet list
* Second item
** Sub item
*** Sub sub item
* Third item
-----
**test list 2**
# Numbered list
# Second item
## Sub item
## Another sub item
# Third item;
```

@endwbs



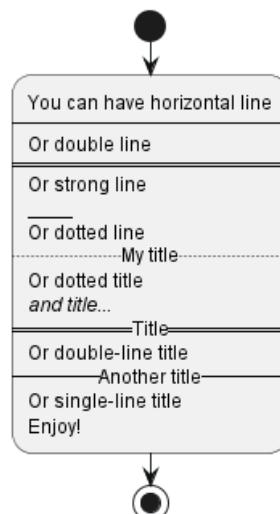


## 22.15 Appendix: Examples of "Creole horizontal lines" on all diagrams

### 22.15.1 Activity

**TODO:** FIXME strong line **----** **TODO:** FIXME

```
@startuml
start
:You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
Or dotted title
//and title... //
==Title==
Or double-line title
--Another title--
Or single-line title
Enjoy!;
stop
@enduml
```



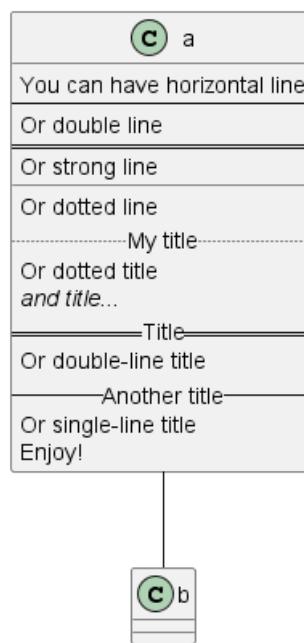
### 22.15.2 Class

```
@startuml
```

```
class a {
You can have horizontal line
-----
Or double line
-----
Or strong line
-----
Or dotted line
..My title..
Or dotted title
//and title... //
==Title==
Or double-line title
--Another title--
Or single-line title
Enjoy!
}
```

```
a -- b
```

```
@enduml
```



### 22.15.3 Component, Deployment, Use-Case

```
@startuml
node n [
You can have horizontal line
-----
Or double line
-----
Or strong line
-----
Or dotted line
..My title..
```



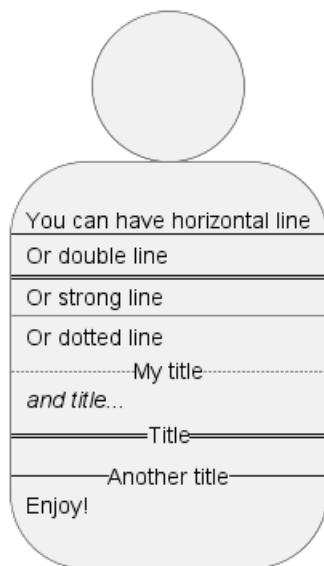
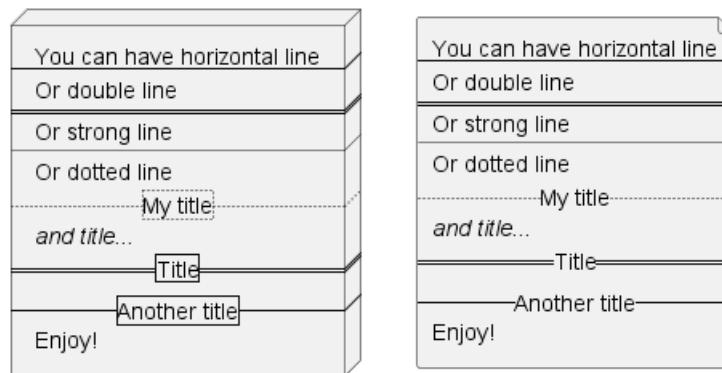
```
//and title... //
==Title==
--Another title--
Enjoy!
]

file f as "
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
//and title... //
==Title==
--Another title--
Enjoy!
"

person p [
You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
//and title... //
==Title==
--Another title--
Enjoy!

]
@enduml
```





#### 22.15.4 Gantt project planning

N/A

#### 22.15.5 Object

```
@startuml
object user {
    You can have horizontal line
    ----
    Or double line
    -----
    Or strong line
    ----
    Or dotted line
    ..My title..
    //and title... //
    ==Title==
    --Another title--
    Enjoy!
}
```

@enduml



user
You can have horizontal line
Or double line
Or strong line
Or dotted line
----- My title -----
and title...
==== Title =====
--- Another title ---
Enjoy!

**TODO:** DONE [Corrected on V1.2020.18]

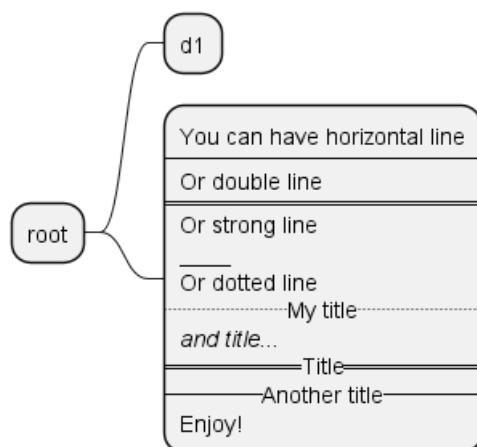
#### 22.15.6 MindMap

**TODO:** FIXME strong line ---- **TODO:** FIXME

@startmindmap

```
* root
** d1
**:You can have horizontal line
-----
Or double line
=====
Or strong line
-----
Or dotted line
..My title...
//and title... //
==Title==
--Another title--
Enjoy!;
```

@endmindmap

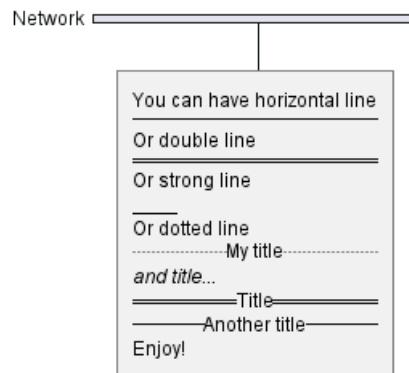


#### 22.15.7 Network (nwdiag)

```
@startuml
nwdiag {
    network Network {
```

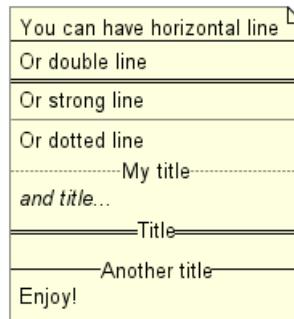


```
Server [description="You can have horizontal line\n----\nOr double line\n====\nOr strong line\n\n}@\n@enduml
```



### 22.15.8 Note

```
@startuml
note as n
You can have horizontal line
----
Or double line
=====
Or strong line
-----
Or dotted line
..My title..
//and title... //
==Title==
--Another title--
Enjoy!
end note
@enduml
```



### 22.15.9 Sequence

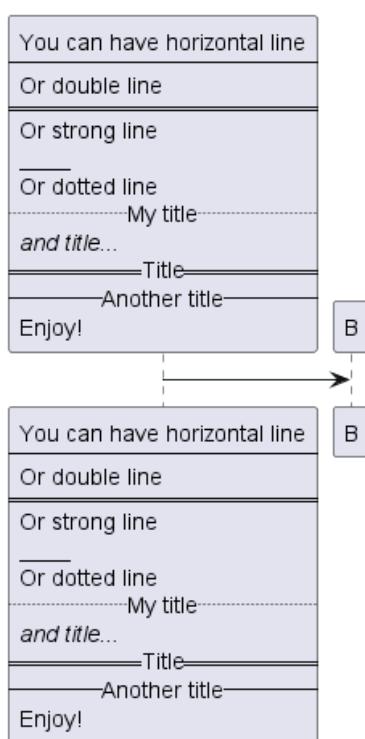
```
@startuml
<style>
participant {HorizontalAlignment left}
</style>
participant Participant [
You can have horizontal line
----
Or double line
```



```
=====
Or strong line
-----
Or dotted line
..My title..
//and title... //
==Title==
--Another title--
Enjoy!
]

participant B

Participant -> B
@enduml
```

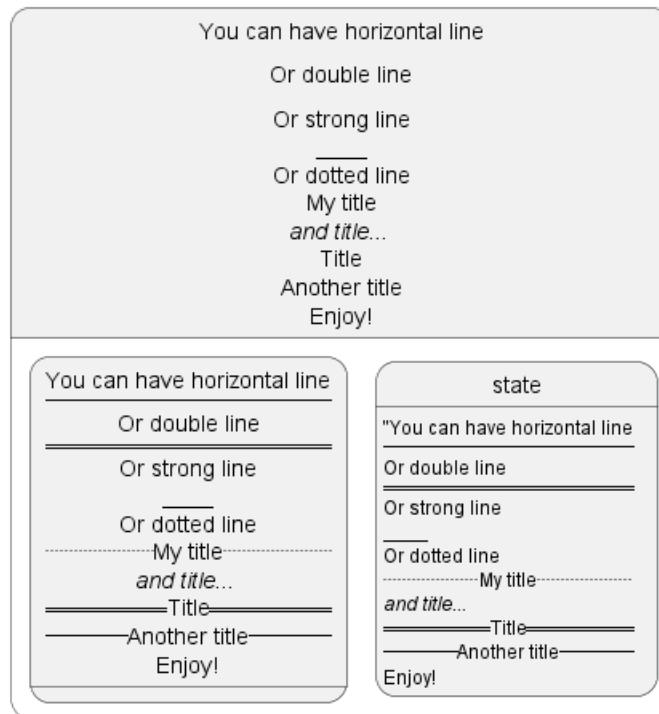


[Ref. QA-15232]

### 22.15.10 State

```
@startuml
<style>
stateDiagram {
title {HorizontalAlignment left}
}
</style>
state "You can have horizontal line\n----\nOr double line\n===== \nOr strong line\n_____\nOr dotted line"
state "You can have horizontal line\n----\nOr double line\n===== \nOr strong line\n_____\nOr dotted line"
state : "You can have horizontal line\n----\nOr double line\n===== \nOr strong line\n_____\nOr dotted line"
}
@enduml
```





[Ref. QA-16978]

### 22.15.11 WBS

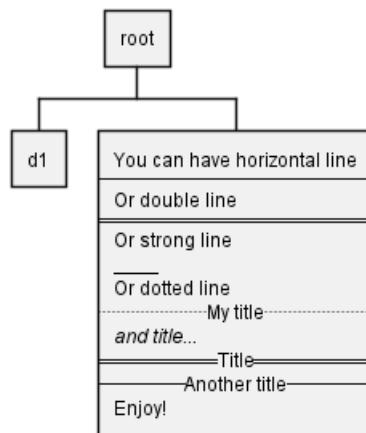
TODO: FIXME strong line ---- TODO: FIXME

@startwbs

```
* root
** d1
**:You can have horizontal line
----
Or double line
=====
Or strong line
-----
Or dotted line
..My title...
//and title... //
==Title==
--Another title--
Enjoy!;
```

@endwbs





## 22.16 Style equivalent (between Creole and HTML)

Style	Creole	Legacy HTML like
<b>bold</b>	This is **bold**	This is <b>bold</b>
<i>italics</i>	This is //italics//	This is <i>italics</i>
<code>monospaced</code>	This is ""monospaced""	This is <font:monospaced>monospaced</font>
stroked	This is --stroked--	This is <s>stroked</s>
<u>underlined</u>	This is __underlined__	This is <u>underlined</u>
waved	This is ~~~	This is <w>waved</w>

```

@startmindmap
* Style equivalent\n(between Creole and HTML)
**:**Creole**
-----
<#silver>|= code|= output
| \n This is ""~**bold**"\n | \n This is **bold** |
| \n This is ""~//italics//"\n | \n This is //italics// |
| \n This is ""~"monospaced~"" "\n | \n This is ""monospaced"" |
| \n This is ""~~stroked~~"\n | \n This is --stroked-- |
| \n This is ""~__underlined__"\n | \n This is __underlined__ |
| \n This is ""~<U+007E><U+007E>waved<U+007E><U+007E>""\n | \n This is ~~waved~~ |;
**:<b>Legacy HTML like
-----
<#silver>|= code|= output
| \n This is ""~<b>bold</b>""\n | \n This is <b>bold</b> |
| \n This is ""~<i>italics</i>""\n | \n This is <i>italics</i> |
| \n This is ""~<font:monospaced>monospaced</font>""\n | \n This is <font:monospaced>monospaced</font> |
| \n This is ""~<s>stroked</s>""\n | \n This is <s>stroked</s> |
| \n This is ""~<u>underlined</u>""\n | \n This is <u>underlined</u> |
| \n This is ""~<w>waved</w>""\n | \n This is <w>waved</w> |

And color as a bonus...
<#silver>|= code|= output
| \n This is ""~<s: #color:green>"green"</color>"">stroked</s>""\n | \n This is <s:green>stroked</s> |
| \n This is ""~<u: #color:red>"red"</color>"">underlined</u>""\n | \n This is <u:red>underlined</u> |
| \n This is ""~<w: #color:#0000FF>"#0000FF"</color>"">waved</w>""\n | \n This is <w:#0000FF>waved</w> |
@endmindmap

```



Creole	
code	output
This is **bold**	This is <b>bold</b>
This is //italics//	This is <i>italics</i>
This is ""monospaced""	This is monospaced
This is --stroked--	This is <del>stroked</del>
This is __underlined__	This is <u>underlined</u>
This is ~~waved~~	This is <u>waved</u>

Legacy HTML like	
code	output
This is <b>bold</b>	This is <b>bold</b>
This is <i>italics</i>	This is <i>italics</i>
This is <font:monospaced>monospaced</font>	This is monospaced
This is <s>stroked</s>	This is <del>stroked</del>
This is <u>underlined</u>	This is <u>underlined</u>
This is <w>waved</w>	This is <u>waved</u>

And color as a bonus...

code	output
This is <s:green>stroked</s>	This is <del>stroked</del>
This is <u:red>underlined</u>	This is <u>underlined</u>
This is <w:#0000FF>waved</w>	This is <u>waved</u>



## 23 Defining and using sprites

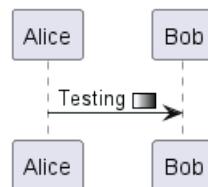
A *Sprite* is a small graphic element that can be used in diagrams.

In PlantUML, sprites are monochrome and can have either 4, 8 or 16 gray level.

To define a sprite, you have to use a hexadecimal digit between 0 and F per pixel.

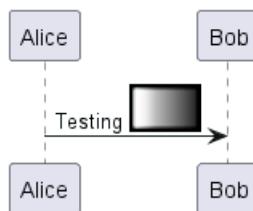
Then you can use the sprite using <\$XXX> where XXX is the name of the sprite.

```
@startuml
sprite $foo1 {
    FFFFFFFFFFFFFF
    F0123456789ABCF
    F0123456789ABCF
}
Alice -> Bob : Testing <$foo1>
@enduml
```



You can scale the sprite.

```
@startuml
sprite $foo1 {
    FFFFFFFFFFFFFF
    F0123456789ABCF
    F0123456789ABCF
}
Alice -> Bob : Testing <$foo1{scale=3}>
@enduml
```

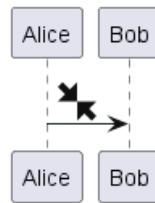


### 23.1 Inline SVG sprite

You can also use inlined SVG for sprites. Only a tiny subset of SVG directives is possible, so you probably have to compress existing SVG files using <https://vecta.io/nano>.

```
@startuml
sprite foo1 <svg width="8" height="8" viewBox="0 0 8 8"><path d="M1 0l-1 1 1.5 1.5-1.5 1.5h4v-4l-1.5
```

```
Alice->Bob : <$foo1*3>
@enduml
```

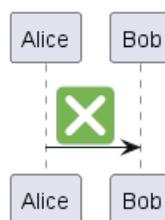


Another example:

```
@startuml
sprite foo1 <svg viewBox="0 0 36 36">
<path fill="#77B255" d="M36 32c0 2.209-1.791 4-4 4H4c-2.209 0-4-1.791-4-4V4c0-2.209 1.791-4 4-4h28c2
<path fill="#FFF" d="M21.529 18.00618.238-8.238c.977-.976.977-2.559 0-3.535-.977-.977-2.559-.977-3.559
</svg>
```

```
Alice->Bob : <$foo1>
```

```
@enduml
```

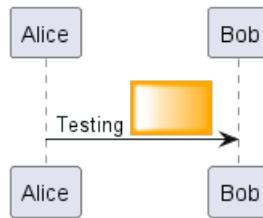


### 23.2 Changing colors

Although sprites are monochrome, it's possible to change their color.

```
@startuml
sprite $foo1 {
    FFFFFFFFFFFFFF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    F0123456789ABCF
    FFFFFFFFFFFFFF
}
Alice -> Bob : Testing <$foo1,scale=3.4,color=orange>
@enduml
```





### 23.3 Encoding Sprite

To encode sprite, you can use the command line like:

```
java -jar plantuml.jar -encodesprite 16z foo.png
```

where `foo.png` is the image file you want to use (it will be converted to gray automatically).

After `-encodesprite`, you have to specify a format: `4`, `8`, `16`, `4z`, `8z` or `16z`.

The number indicates the gray level and the optional `z` is used to enable compression in sprite definition.

### 23.4 Importing Sprite

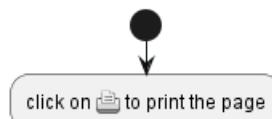
You can also launch the GUI to generate a sprite from an existing image.

Click in the menubar then on **File/Open Sprite Window**.

After copying an image into your clipboard, several possible definitions of the corresponding sprite will be displayed : you will just have to pickup the one you want.

### 23.5 Examples

```
@startuml
sprite $printer [15x15/8z] N0tH3W0W208HxFz_kMAhj71HWpa1XC716sz0Pq4MVPEWfBHIuxP3L6kbTcizR8tAhzaqFvXwv
start
:click on <$printer> to print the page;
@enduml
```



```
@startuml
sprite $bug [15x15/16z] PKzR2i0m2BFMi15p__FEjQEeqB1z27aeqCqixa8S40T7C53cKpsHpaYPDJY_12MHM-BLRyywPhrr
sprite $printer [15x15/8z] N0tH3W0W208HxFz_kMAhj71HWpa1XC716sz0Pq4MVPEWfBHIuxP3L6kbTcizR8tAhzaqFvXwv
sprite $disk {
    444445566677881
    436000000009991
    43600000000ACA1
    53700000001A7A1
    53700000012B8A1
    53800000123B8A1
    63800001233C9A1
    634999AABC99B1
    744566778899AB1
    7456AAAAA99AAB1
    8566AFC228AABB1
    8567AC8118BBBB1
    867BD4433BBBBB1
    39AAAAABBBBBBC1
}
```

}



```

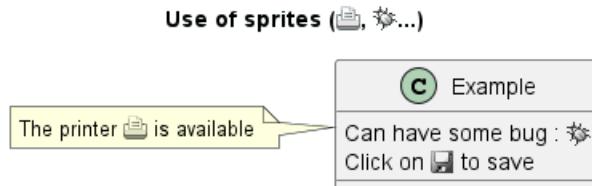
title Use of sprites (<$printer>, <$bug>...)

class Example {
Can have some bug : <$bug>
Click on <$disk> to save
}

note left : The printer <$printer> is available

@enduml

```



## 23.6 StdLib

The PlantUML StdLib includes a number of ready icons in various IT areas such as architecture, cloud services, logos etc. It including AWS, Azure, Kubernetes, C4, product Logos and many others. To explore these libraries:

- Browse the Github folders of PlantUML StdLib
- Browse the source repos of StdLib collections that interest you. Eg if you are interested in logos you can find that it came from gilbarbara-plantuml-sprites, and quickly find its sprites-list. (The next section shows how to list selected sprites but unfortunately that's in grayscale whereas this custom listing is in color.)
- Study the in-depth Hitchhiker's Guide to PlantUML, eg sections Standard Library Sprites and PlantUML Stdlib Overview

## 23.7 Listing Sprites

You can use the `listsprites` command to show available sprites:

- Used on its own, it just shows ArchiMate sprites
- If you include some sprite libraries in your diagram, the command shows all these sprites, as explained in View all the icons with `listsprites`.

(Example from Hitchhikers Guide to PlantUML)

```

@startuml
!define osaPuml https://raw.githubusercontent.com/Crashedmind/PlantUML-opensecurityarchitecture2-ico...
!include osaPuml/Common.puml
!include osaPuml/User/all.puml
!include osaPuml/Hardware/all.puml
!include osaPuml/Misc/all.puml
!include osaPuml/Server/all.puml
!include osaPuml/Site/all.puml

listsprites

' From The Hitchhiker's Guide to PlantUML
@enduml

```





Most collections have files called `all` that allow you to see a whole sub-collection at once. Else you need to find the sprites that interest you and include them one by one. Unfortunately, the version of a collection included in StdLib often does not have such `all` files, so as you see above we include the collection from github, not from StdLib.

All sprites are in grayscale, but most collections define specific macros that include appropriate (vendor-specific) colors.

## 24 Skinparam command

You can change colors and font of the drawing using the `skinparam` command.

Example:

```
skinparam backgroundColor transparent
```

### 24.1 Usage

You can use this command :

- In the diagram definition, like any other commands,
- In an included file,
- In a configuration file, provided in the command line or the ANT task.

### 24.2 Nested

To avoid repetition, it is possible to nest definition. So the following definition :

```
skinparam xxxxParam1 value1
skinparam xxxxParam2 value2
skinparam xxxxParam3 value3
skinparam xxxxParam4 value4
```

is strictly equivalent to:

```
skinparam xxxx {
    Param1 value1
    Param2 value2
    Param3 value3
    Param4 value4
}
```

### 24.3 Black and White

You can force the use of a black&white output using `skinparam monochrome true` command.

```
@startuml
```

```
skinparam monochrome true

actor User
participant "First Class" as A
participant "Second Class" as B
participant "Last Class" as C

User -> A: DoWork
activate A

A -> B: Create Request
activate B

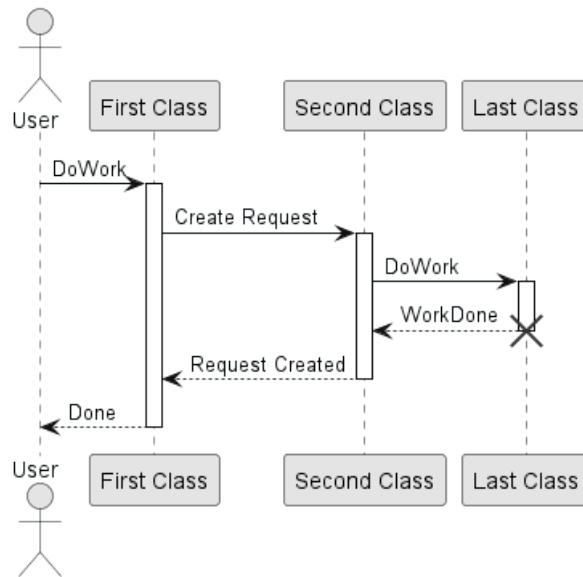
B -> C: DoWork
activate C
C --> B: WorkDone
destroy C

B --> A: Request Created
deactivate B
```



```
A --> User: Done
deactivate A

@enduml
```



## 24.4 Shadowing

You can disable the shadowing using the `skinparam shadowing false` command.

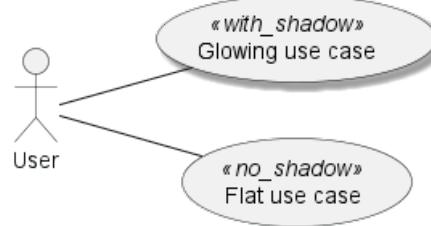
```
@startuml
```

left to right direction

```
skinparam shadowing<<no_shadow>> false
skinparam shadowing<<with_shadow>> true

actor User
(Glowing use case) <<with_shadow>> as guc
(Flat use case) <<no_shadow>> as fuc
User -- guc
User -- fuc
```

```
@enduml
```



## 24.5 Reverse colors

You can force the use of a black&white output using `skinparam monochrome reverse` command. This can be useful for black background environment.

```
@startuml
```

```
skinparam monochrome reverse
```



```
actor User
participant "First Class" as A
participant "Second Class" as B
participant "Last Class" as C
```

```
User -> A: DoWork
activate A
```

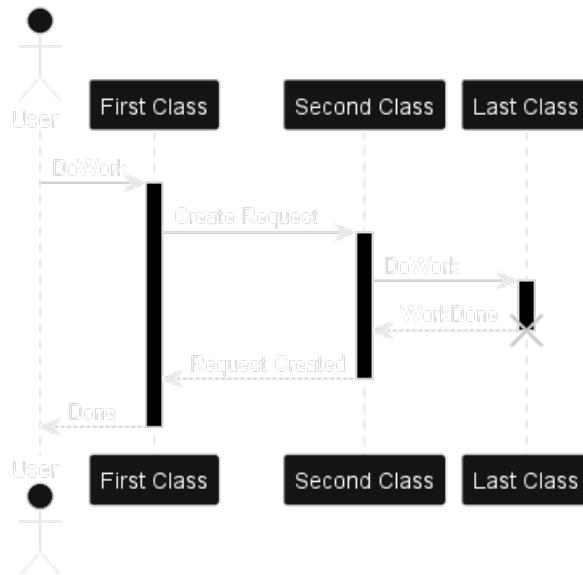
```
A -> B: Create Request
activate B
```

```
B -> C: DoWork
activate C
C --> B: WorkDone
destroy C
```

```
B --> A: Request Created
deactivate B
```

```
A --> User: Done
deactivate A
```

```
@enduml
```



## 24.6 Colors

You can use either standard color name or RGB code.

```
@startuml
colors
@enduml
```



APPLICATION	Crimson	DeepPink	Indigo	LightYellow	Navy	RoyalBlue	Turquoise
AliceBlue	Cyan	DeepSkyBlue	Ivory	Lime	OldLace	STRATEGY	Violet
AntiqueWhite	DarkBlue	DimGray	Khaki	LimeGreen	Olive	SaddleBrown	Wheat
Aqua	DarkCyan	DimGrey	Lavender	Linen	OliveDrab	Salmon	White
Aquamarine	DarkGoldenRod	DodgerBlue	LavenderBlush	MOTIVATION	Orange	SandyBrown	WhiteSmoke
Azure	DarkGray	FireBrick	LawnGreen	Magenta	OrangeRed	SeaGreen	Yellow
BUSINESS	DarkGreen	FloralWhite	LemonChiffon	Maroon	Orchid	SeaShell	YellowGreen
Beige	DarkGrey	ForestGreen	LightBlue	MediumAquaMarine	PHYSICAL	Sienna	
Bisque	DarkKhaki	Fuchsia	LightCoral	MediumBlue	PaleGoldenRod	Silver	
Black	DarkMagenta	Gainsboro	LightCyan	MediumOrchid	PaleGreen	SkyBlue	
BlanchedAlmond	DarkOliveGreen	GhostWhite	LightGoldenRodYellow	MediumPurple	PaleTurquoise	SlateBlue	
Blue	DarkOrchid	Gold	LightGray	MediumSeaGreen	PaleVioletRed	SlateGray	
BlueViolet	DarkRed	GoldenRod	LightGreen	MediumSlateBlue	PapayaWhip	SlateGrey	
Brown	DarkSalmon	Gray	LightGrey	MediumSpringGreen	PeachPuff	Snow	
BurlyWood	DarkSeaGreen	Green	LightPink	MediumTurquoise	Peru	SpringGreen	
CadetBlue	DarkSlateBlue	GreenYellow	LightSalmon	MediumVioletRed	Pink	SteelBlue	
Chartreuse	DarkSlateGray	Grey	LightSeaGreen	MidnightBlue	Plum	TECHNOLOGY	
Chocolate	DarkSlateGrey	HoneyDew	LightSkyBlue	MintCream	PowderBlue	Tan	
Coral	DarkTurquoise	HotPink	LightSlateGray	MistyRose	Purple	Teal	
CornflowerBlue	DarkViolet	IMPLEMENTATION	LightSlateGrey	Moccasin	Red	Thistle	
Cornsilk	DarkOrange	IndianRed	LightSteelBlue	NavajoWhite	RosyBrown	Tomato	

transparent can only be used for background of the image.

## 24.7 Font color, name and size

You can change the font for the drawing using `xxxFontColor`, `xxxFontSize` and `xxxFontName` parameters.

Example:

```
skinparam classFontColor red
skinparam classFontSize 10
skinparam classFontName Aapex
```

You can also change the default font for all fonts using `skinparam defaultFontName`.

Example:

```
skinparam defaultFontName Aapex
```

Please note the fontname is highly system dependent, so do not over use it, if you look for portability. `Helvetica` and `Courier` should be available on all systems.

A lot of parameters are available. You can list them using the following command:

```
java -jar plantuml.jar -language
```

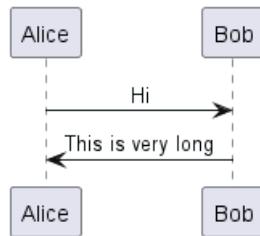
## 24.8 Text Alignment

Text alignment can be set to `left`, `right` or `center` in `skinparam sequenceMessageAlign`. You can also use `direction` or `reverseDirection` values to align text depending on arrow direction.

Param name	Default value	Comment
sequenceMessageAlign	left	Used for messages in sequence diagrams
sequenceReferenceAlign	center	Used for <code>ref</code> over in sequence diagrams

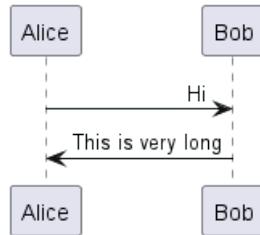
```
@startuml
skinparam sequenceMessageAlign center
Alice -> Bob : Hi
Bob -> Alice : This is very long
@enduml
```





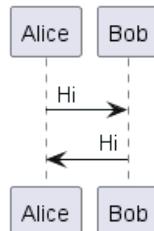
```

@startuml
skinparam sequenceMessageAlign right
Alice -> Bob : Hi
Bob -> Alice : This is very long
@enduml
  
```



```

@startuml
skinparam sequenceMessageAlign direction
Alice -> Bob : Hi
Bob -> Alice: Hi
@enduml
  
```



## 24.9 Examples

```

@startuml
skinparam backgroundColor #EEEBCD
skinparam handwritten true

skinparam sequence {
ArrowColor DeepSkyBlue
ActorBorderColor DeepSkyBlue
LifeLineBorderColor blue
LifeLineBackgroundColor #A9DCDF

ParticipantBorderColor DeepSkyBlue
ParticipantBackgroundColor DodgerBlue
ParticipantFontName Impact
ParticipantFontSize 17
ParticipantFontColor #A9DCDF

ActorBackgroundColor aqua
ActorFontColor DeepSkyBlue
ActorFontSize 17
ActorFontName Aapex
  
```



```

}

actor User
participant "First Class" as A
participant "Second Class" as B
participant "Last Class" as C

User -> A: DoWork
activate A

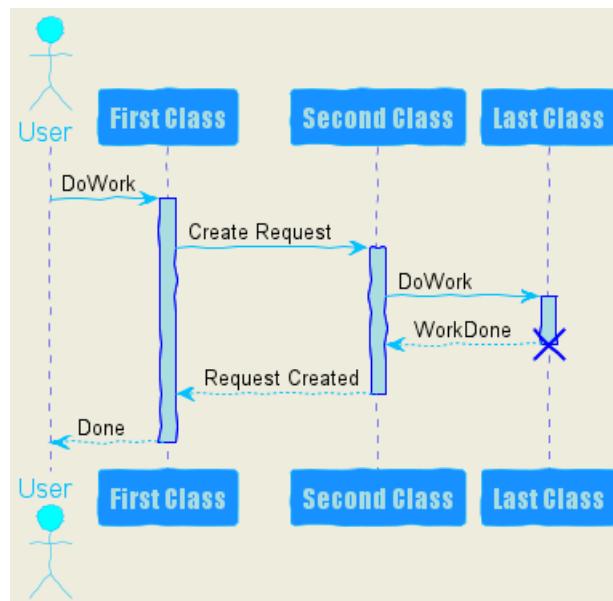
A -> B: Create Request
activate B

B -> C: DoWork
activate C
C --> B: WorkDone
destroy C

B --> A: Request Created
deactivate B

A --> User: Done
deactivate A
@enduml

```



```

@startuml
skinparam handwritten true

skinparam actor {
BorderColor black
FontName Courier
    BackgroundColor<< Human >> Gold
}

skinparam usecase {
BackgroundColor DarkSeaGreen
BorderColor DarkSlateGray

BackgroundColor<< Main >> YellowGreen

```

```

BorderColor<< Main >> YellowGreen

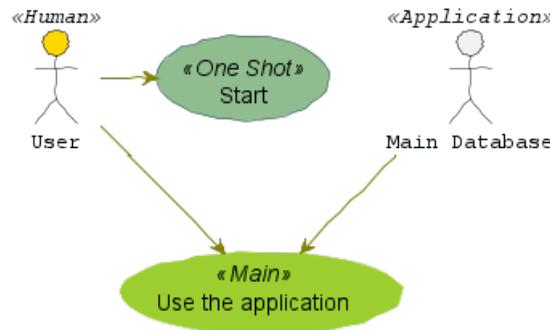
ArrowColor Olive
}

User << Human >>
:Main Database: as MySql << Application >>
(Start) << One Shot >>
(Use the application) as (Use) << Main >>

User -> (Start)
User --> (Use)

MySql --> (Use)
@enduml

```



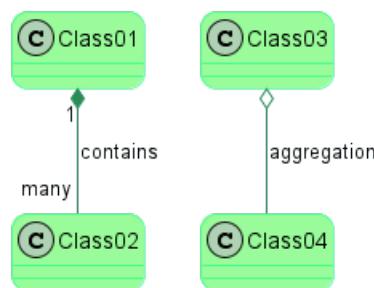
```

@startuml
skinparam roundcorner 20
skinparam class {
BackgroundColor PaleGreen
ArrowColor SeaGreen
BorderColor SpringGreen
}
skinparam stereotypeCBackgroundColor YellowGreen

Class01 "1" *-- "many" Class02 : contains

Class03 o-- Class04 : aggregation
@enduml

```



```

@startuml
skinparam interface {
  backgroundColor RosyBrown
  borderColor orange
}

skinparam component {
  FontSize 13

```

```

BackgroundColor<<Apache>> LightCoral
BorderColor<<Apache>> #FF6655
FontName Courier
BorderColor black
BackgroundColor gold
ArrowFontName Impact
ArrowColor #FF6655
ArrowFontColor #777777
}

```

```

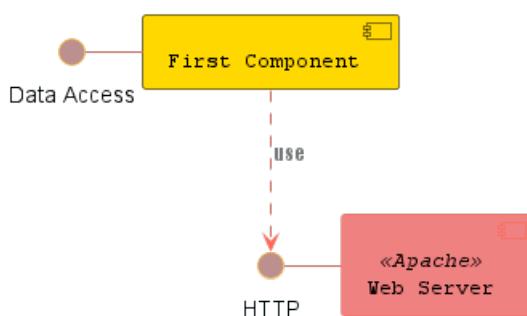
() "Data Access" as DA
[Web Server] << Apache >>

```

```

DA - [First Component]
[First Component] ..> () HTTP : use
HTTP - [Web Server]
@enduml

```



```

@startuml
[AA] <<static lib>>
[BB] <<shared lib>>
[CC] <<static lib>>

```

```

node node1
node node2 <<shared node>>
database Production

```

```

skinparam component {
    backgroundColor<<static lib>> DarkKhaki
    backgroundColor<<shared lib>> Green
}

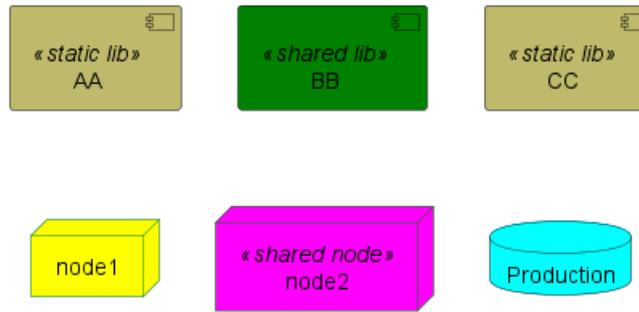
```

```

skinparam node {
borderColor Green
backgroundColor Yellow
backgroundColor<<shared node>> Magenta
}
skinparam databaseBackgroundColor Aqua
@enduml

```





## 24.10 List of all skinparam parameters

You can use `-language` on the command line or generate a "diagram" with a list of all the skinparam parameters using :

- `help skinparams`
- `skinparameters`

### 24.10.1 Command Line: `-language` command

Since the documentation is not always up to date, you can have the complete list of parameters using this command:

```
java -jar plantuml.jar -language
```

### 24.10.2 Command: `help skinparams`

That will give you the following result, from this page (*code of this command*): `CommandHelpSkinparam.java`

```
@startuml
help skinparams
@enduml
```

#### Welcome to PlantUML!

You can start with a simple UML Diagram like:

```
Bob->Alice: Hello
```

Or

```
class Example
```

You will find more information about PlantUML syntax on <https://plantuml.com>

(Details by typing `license` keyword)



```
PlantUML 1.2023.11
[From string (line 2) ]

@startuml
help skinparams
Syntax Error?
```

### 24.10.3 Command: `skinparameters`

```
@startuml
skinparameters
@enduml
```



ActivityBackgroundColor	ClassFontStyle	FolderStereotypeFontSize	NoteFontStyle	SequenceDelayFontName
ActivityBorderColor	ClassStereotypeFontColor	FolderStereotypeFontStyle	NoteShadowing	SequenceDelayFontSize
ActivityBorderThickness	ClassStereotypeFontName	FooterFontColor	NoteTextAlignment	SequenceDelayFontStyle
ActivityDiamondFontColor	ClassStereotypeFontSize	FooterFontName	ObjectAttributeFontColor	SequenceDividerBorderThickness
ActivityDiamondFontName	ClassStereotypeFontStyle	FooterFontSize	ObjectAttributeFontName	SequenceDividerFontColor
ActivityDiamondFontSize	CloudFontColor	FooterFontStyle	ObjectAttributeFontSize	SequenceDividerFontName
ActivityDiamondFontStyle	CloudFontName	FrameFontColor	ObjectAttributeFontStyle	SequenceDividerFontSize
ActivityFontColor	CloudFontSize	FrameFontName	ObjectBorderThickness	SequenceDividerFontStyle
ActivityFontName	CloudFontStyle	FrameFontSize	ObjectFontColor	SequenceGroupBodyBackgroundColor
ActivityFontSize	CloudStereotypeFontColor	FrameFontStyle	ObjectFontName	SequenceGroupBorderThickness
ActivityFontStyle	CloudStereotypeFontName	FrameStereotypeFontColor	ObjectFontSize	SequenceGroupFontColor
ActorBackgroundColor	CloudStereotypeFontSize	FrameStereotypeFontName	ObjectFontStyle	SequenceGroupFontName
ActorBorderColor	CloudStereotypeFontStyle	FrameStereotypeFontSize	ObjectStereotypeFontColor	SequenceGroupFontSize
ActorFontColor	ColorArrowSeparationSpace	FrameStereotypeFontStyle	ObjectStereotypeFontName	SequenceGroupFontStyle
ActorFontName	ComponentBorderThickness	GenericDisplay	ObjectStereotypeFontSize	SequenceGroupHeaderFontColor
ActorFontSize	ComponentFontColor	Guillemet	ObjectStereotypeFontStyle	SequenceGroupHeaderFontName
ActorFontStyle	ComponentFontName	Handwritten	PackageBorderThickness	SequenceGroupHeaderFontSize
ActorStereotypeFontColor	ComponentFontSize	HeaderFontColor	PackageFontColor	SequenceGroupHeaderFontStyle
ActorStereotypeFontName	ComponentFontStyle	HeaderFontName	PackageFontName	SequenceGroupHeaderLineBorderColor
ActorStereotypeFontSize	ComponentStereotypeFontColor	HeaderFontSize	PackageFontSize	SequenceGroupHeaderLineBorderThickness
ActorStereotypeFontStyle	ComponentStereotypeFontName	HeaderFontStyle	PackageFontStyle	SequenceGroupMessageAlignment
AgentBorderThickness	ComponentStereotypeFontSize	HexagonBorderThickness	PackageStereotypeFontColor	SequenceNewpageSeparatorColor
AgentFontColor	ComponentStereotypeFontStyle	HexagonFontColor	PackageStereotypeFontSize	SequenceParticipant
AgentFontName	ComponentStyle	HexagonFontName	PackageStereotypeFontStyle	SequenceParticipantBorderThickness
AgentFontSize	ConditionEndStyle	HexagonFontSize	PackageTitleAlignment	SequenceReferenceAlignment
AgentFontStyle	ConditionStyle	HexagonFontStyle	Padding	SequenceReferenceBackgroundColor
AgentStereotypeFontColor	ControlFontColor	HexagonStereotypeFontColor	PageBorderColor	SequenceReferenceBorderThickness
AgentStereotypeFontName	ControlFontName	HexagonStereotypeFontName	PageExternalColor	SequenceReferenceFontColor
AgentStereotypeFontSize	ControlFontSize	HexagonStereotypeFontSize	PageMargin	SequenceReferenceFontName
AgentStereotypeFontStyle	ControlFontStyle	HexagonStereotypeFontStyle	ParticipantFontColor	SequenceReferenceFontSize
ArchimateBorderThickness	ControlStereotypeFontColor	HyperlinkColor	ParticipantFontName	SequenceReferenceFontStyle
ArchimateFontColor	ControlStereotypeFontName	HyperlinkUnderline	ParticipantFontSize	SequenceReferenceHeaderBackgroundColor
ArchimateFontName	ControlStereotypeFontSize	IconEMandatoryColor	ParticipantFontStyle	SequenceStereotypeFontColor
ArchimateFontSize	ControlStereotypeFontStyle	IconPackageBackgroundColor	ParticipantPadding	SequenceStereotypeFontName
ArchimateFontStyle	DatabaseFontColor	IconPackageColor	ParticipantStereotypeFontColor	SequenceStereotypeFontSize
ArchimateStereotypeFontColor	DatabaseFontName	IconPrivateBackgroundColor	ParticipantStereotypeFontName	SequenceStereotypeFontStyle
ArchimateStereotypeFontName	DatabaseFontSize	IconPrivateColor	ParticipantStereotypeFontSize	Shadowing
ArchimateStereotypeFontSize	DatabaseFontStyle	IconProtectedBackgroundColor	ParticipantStereotypeFontSize	StackFontColor
ArchimateStereotypeFontStyle	DatabaseStereotypeFontColor	IconProtectedColor	ParticipantStereotypeFontStyle	StackFontName
ArrowFontColor	DatabaseStereotypeFontName	IconPublicBackgroundColor	PartitionBorderThickness	StackFontSize
ArrowFontName	DatabaseStereotypeFontSize	IconPublicColor	PartitionFontColor	StackFontStyle
ArrowFontSize	DatabaseStereotypeFontStyle	InterfaceFontColor	PartitionFontName	StackStereotypeFontColor
ArrowFontStyle	DefaultFontColor	InterfaceFontName	PartitionFontSize	StackStereotypeFontName
ArrowHeadColor	DefaultFontName	InterfaceFontSize	PartitionFontStyle	StackStereotypeFontSize
ArrowLollipopColor	DefaultFontSize	InterfaceFontStyle	PathHoverColor	StackStereotypeFontSize
ArrowMessageAlignment	DefaultFontStyle	InterfaceStereotypeFontColor	PersonBorderThickness	StateAttributeFontColor
ArrowThickness	DefaultMonospacedFontName	InterfaceStereotypeFontName	PersonFontColor	StateAttributeFontName
ArtifactFontColor	DefaultTextAlignment	InterfaceStereotypeFontSize	PersonFontName	StateAttributeFontSize
ArtifactFontName	DesignedBackgroundColor	InterfaceStereotypeFontStyle	PersonFontSize	StateAttributeFontStyle
ArtifactFontSize	DesignedBorderColor	LabelFontColor	PersonFontStyle	StateBorderColor
ArtifactFontStyle	DesignedDomainBorderThickness	LabelFontName	PersonStereotypeFontColor	StateFontColor
ArtifactStereotypeFontColor	DesignedDomainFontColor	LabelFontSize	PersonStereotypeFontName	StateFontName
ArtifactStereotypeFontName	DesignedDomainFontName	LabelFontStyle	PersonStereotypeFontSize	StateFontSize
ArtifactStereotypeFontSize	DesignedDomainFontSize	LabelStereotypeFontColor	PersonStereotypeFontStyle	StateFontStyle
ArtifactStereotypeFontStyle	DesignedDomainFontStyle	LabelStereotypeFontName	PersonStereotypeFontSize	StateMessageAlignment
BackgroundColor	DesignedDomainStereotypeFontColor	LabelStereotypeFontSize	QueueBorderThickness	StereotypePosition
BiddableBackgroundColor	DesignedDomainStereotypeFontName	LabelStereotypeFontStyle	QueueFontColor	StorageFontColor
BiddableBorderColor	DesignedDomainStereotypeFontSize	LegendBorderThickness	QueueFontName	StorageFontName
BoundaryFontColor	DesignedDomainStereotypeFontStyle	LegendFontColor	QueueFontSize	StorageFontSize
BoundaryFontName	DiagramBorderColor	LegendFontName	QueueFontStyle	StorageFontStyle
BoundaryFontSize	DiagramBorderThickness	LegendFontSize	QueueStereotypeFontColor	StorageStereotypeFontColor
BoundaryFontStyle	DomainBackgroundColor	LegendFontStyle	QueueStereotypeFontName	StorageStereotypeFontName
BoundaryStereotypeFontColor	DomainBorderColor	LexicalBackgroundColor	QueueStereotypeFontSize	StorageStereotypeFontSize
BoundaryStereotypeFontName	DomainBorderThickness	LexicalBorderColor	QueueStereotypeFontStyle	StorageStereotypeFontStyle
BoundaryStereotypeFontSize	DomainFontColor	LifelineStrategy	Ranksep	StorageStereotypeFontStyle
BoundaryStereotypeFontStyle	DomainFontName	Linetype	RectangleBorderThickness	Style
BoxPadding	DomainFontSize	MachineBackgroundColor	RectangleFontColor	SvglinkTarget
CaptionFontColor	DomainFontStyle	MachineBorderColor	RectangleFontName	SwimlaneBorderThickness
CaptionFontName	DomainStereotypeFontColor	MachineBorderThickness	RectangleFontSize	SwimlaneTitleFontColor
CaptionFontSize	DomainStereotypeFontName	MachineFontColor	RectangleFontStyle	SwimlaneTitleFontName
CaptionFontStyle	DomainStereotypeFontSize	MachineFontName	RectangleStereotypeFontColor	SwimlaneTitleFontSize
CardBorderThickness	DomainStereotypeFontStyle	MachineFontSize	RectangleStereotypeFontName	SwimlaneTitleFontStyle
CardFontColor	Dpi	MachineFontStyle	RectangleStereotypeFontSize	SwimlaneWidth
CardFontName	EntityFontColor	MachineStereotypeFontColor	RequirementBackgroundColor	TabSize
CardFontSize	EntityFontName	MachineStereotypeFontName	RequirementBorderColor	TimingFontColor
CardFontStyle	EntityFontSize	MachineStereotypeFontSize	RequirementBorderThickness	TimingFontSize
CardStereotypeFontColor	EntityFontStyle	MachineStereotypeFontStyle	RequirementFontColor	TimingFontStyle
CardStereotypeFontName	EntityStereotypeFontColor	MaxAsciiMessageLength	RequirementFontName	TitleBorderRoundCorner
CardStereotypeFontSize	EntityStereotypeFontName	MaxMessageSize	RequirementFontSize	TitleBorderThickness
CardStereotypeFontStyle	EntityStereotypeFontSize	MinClassWidth	RequirementFontStyle	TitleFontColor
CircledCharacterFontColor	EntityStereotypeFontStyle	Monochrome	RequirementStereotypeFontColor	TitleFontName
CircledCharacterFontName	FileFontColor	NodeFontColor	RequirementStereotypeFontName	TitleFontSize
CircledCharacterFontSize	FileFontName	NodeFontName	RequirementStereotypeFontSize	TitleFontStyle
CircledCharacterFontStyle	FileFontSize	NodeFontSize	RequirementStereotypeFontStyle	UsecaseBorderThickness
CircledCharacterRadius	FileFontStyle	NodeFontStyle	RequirementStereotypeFontSize	UsecaseFontColor
ClassAttributeFontColor	FileStereotypeFontColor	NodeStereotypeFontColor	ResponseMessageBelowArrow	UsecaseFontName
ClassAttributeFontName	FileStereotypeFontName	NodeStereotypeFontName	RoundCorner	UsecaseFontSize
ClassAttributeFontSize	FileStereotypeFontSize	NodeStereotypeFontSize	SameClassWidth	UsecaseFontStyle
ClassAttributeIconSize	FileStereotypeFontStyle	NodeStereotypeFontStyle	SequenceActorBorderThickness	UsecaseStereotypeFontColor
ClassBackgroundColor	FixCircleLabelOverlapping	Nodesep	SequenceArrowThickness	UsecaseStereotypeFontName
ClassBorderColor	FolderFontColor	NoteBackgroundColor	SequenceBoxBorderColor	UsecaseStereotypeFontSize
ClassBorderThickness	FolderFontName	NoteBorderColor	SequenceBoxFontColor	UsecaseStereotypeFontStyle
ClassFontColor	FolderFontSize	NoteBorderThickness	SequenceBoxFontName	UsecaseStereotypeFontSize
ClassFontName	FolderFontStyle	NoteFontColor	SequenceBoxFontSize	UsecaseStereotypeFontStyle
ClassFontSize	FolderStereotypeFontColor	NoteFontName	SequenceBoxFontStyle	WrapWidth
ClassFontSize	FolderStereotypeFontName	NoteFontSize	SequenceDelayFontColor	



#### 24.10.4 All Skin Parameters on the Ashley's PlantUML Doc

You can also view each skinparam parameters with its results displayed at the page [All Skin Parameters of Ashley's PlantUML Doc](#):

- <https://plantuml-documentation.readthedocs.io/en/latest/formatting/all-skin-params.html>.



## 25 Preprocessing

Some preprocessing capabilities are included in **PlantUML**, and available for *all* diagrams.

Those functionalities are very similar to the C language preprocessor, except that the special character # has been changed to the exclamation mark !.

### 25.1 Variable definition [=, ?=]

Although this is not mandatory, we highly suggest that variable names start with a \$.

There are three types of data:

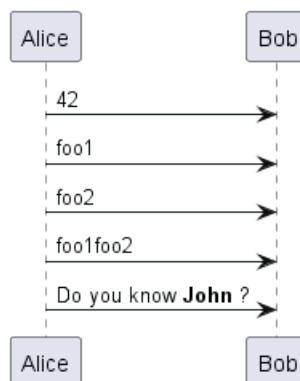
- **Integer number** (*int*);
- **String** (*str*) - these must be surrounded by single quote or double quote;
- **JSON** (*JSON*) - these must be surrounded by curly brackets.

(*for JSON variable definition and usage, see more details on Preprocessing-JSON page*)

Variables created outside function are **global**, that is you can access them from everywhere (including from functions). You can emphasize this by using the optional **global** keyword when defining a variable.

```
@startuml
!$a = 42
!$ab = "foo1"
!$cd = "foo2"
!$ef = $ab + $cd
!$foo = { "name": "John", "age" : 30 }
```

```
Alice -> Bob : $a
Alice -> Bob : $ab
Alice -> Bob : $cd
Alice -> Bob : $ef
Alice -> Bob : Do you know **$foo.name** ?
@enduml
```



You can also assign a value to a variable, only if it is not already defined, with the syntax: !\$a ?= "foo"

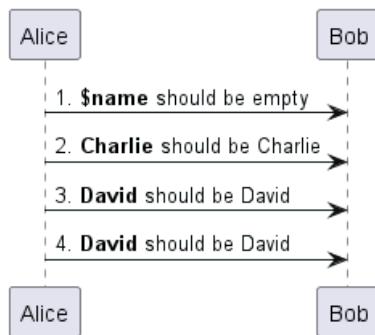
```
@startuml
Alice -> Bob : 1. **$name** should be empty

$name ?= "Charlie"
Alice -> Bob : 2. **$name** should be Charlie

$name = "David"
Alice -> Bob : 3. **$name** should be David

$name ?= "Ethan"
Alice -> Bob : 4. **$name** should be David
```

```
@enduml
```



## 25.2 Boolean expression

### 25.2.1 Boolean representation [0 is false]

There is not real boolean type, but PlantUML use this integer convention:

- Integer 0 means **false**
- and any non-null number (as 1) or any string (as "1", or even "0") means **true**.

[Ref. QA-9702]

### 25.2.2 Boolean operation and operator [&&, ||, ()]

You can use boolean expression, in the test, with :

- *parenthesis ()*;
- *and operator &&*;
- *or operator ||*.

(See next example, within *if* test.)

### 25.2.3 Boolean builtin functions [%false(), %true(), %not(<exp>) ]

For convenience, you can use those boolean builtin functions:

- `%false()`
- `%true()`
- `%not(<exp>)`

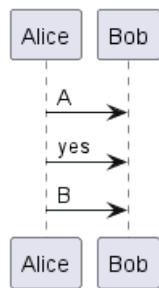
[See also *Builtin functions*]

## 25.3 Conditions [*!if, !else, !elseif, !endif*]

- You can use expression in condition.
- *else* and *elseif* are also implemented

```
@startuml
!$a = 10
!$ijk = "foo"
Alice -> Bob : A
!if ($ijk == "foo") && ($a+10>=4)
Alice -> Bob : yes
!else
Alice -> Bob : This should not appear
!endif
Alice -> Bob : B
@enduml
```





## 25.4 While loop [`!while`, `!endwhile`]

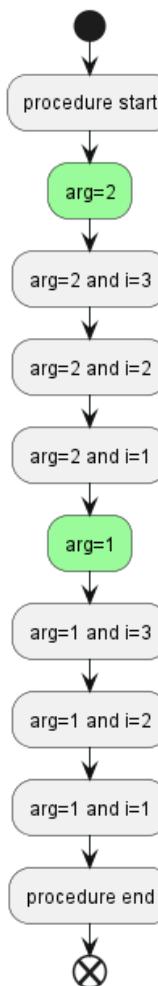
You can use `!while` and `!endwhile` keywords to have repeat loops.

### 25.4.1 While loop (on Activity diagram)

```
@startuml
!procedure $foo($arg)
:procedure start;
!while $arg!=0
    !$i=3
    #palegreen:arg=$arg;
    !while $i!=0
        :arg=$arg and i=$i;
        !$i = $i - 1
    !endwhile
    !$arg = $arg - 1
    !endwhile
:procedure end;
!endprocedure

start
$foo(2)
end
@enduml
```





[Adapted from QA-10838]

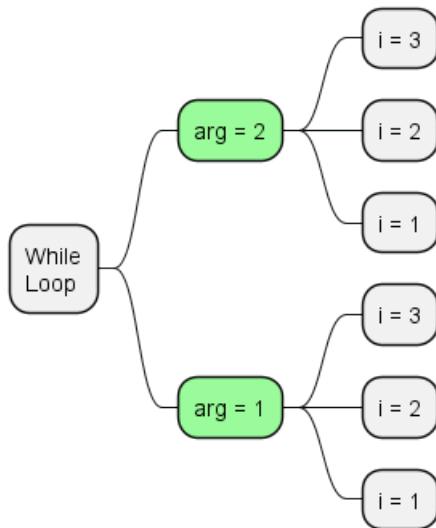
#### 25.4.2 While loop (on Mindmap diagram)

```

@startmindmap
!procedure $foo($arg)
  !$arg!=0
  !$i=3
  **[#palegreen] arg = $arg
  !while $i!=0
    *** i = $i
    !$i = $i - 1
  !endwhile
  !$arg = $arg - 1
!endwhile
!endprocedure

*:While
Loop;
$foo(2)
@endmindmap
  
```





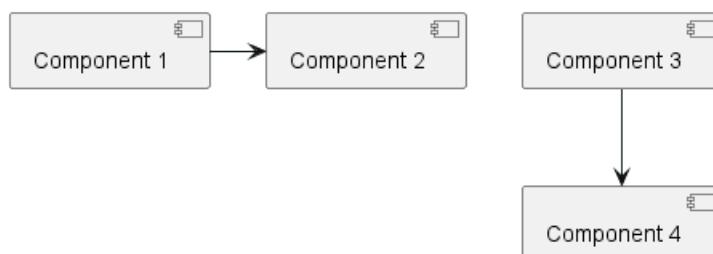
### 25.4.3 While loop (on Component/Deployment diagram)

```

@startuml
!procedure $foo($arg)
  !while $arg!=0
    [Component $arg] as $arg
    !$arg = $arg - 1
  !endwhile
!endprocedure

$foo(4)

1->2
3-->4
@enduml
  
```



[Ref. QA-14088]

## 25.5 Procedure [!procedure, !endprocedure]

- Procedure names *should* start with a \$
- Argument names *should* start with a \$
- Procedures can call other procedures

Example:

```

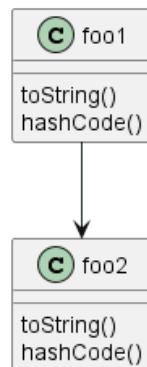
@startuml
!procedure $msg($source, $destination)
  $source --> $destination
!endprocedure
  
```



```
!procedure $init_class($name)
  class $name {
    $addCommonMethod()
  }
!endprocedure
```

```
!procedure $addCommonMethod()
  toString()
  hashCode()
!endprocedure
```

```
$init_class("foo1")
$init_class("foo2")
$msg("foo1", "foo2")
@enduml
```



Variables defined in procedures are **local**. It means that the variable is destroyed when the procedure ends.

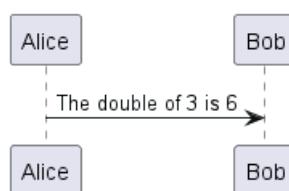
## 25.6 Return function [!function, !endfunction]

A return function does not output any text. It just define a function that you can call:

- directly in variable definition or in diagram text
- from other return functions
- from procedures
- Function name *should* start with a \$
- Argument names *should* start with a \$

```
@startuml
!function $double($a)
!return $a + $a
!endfunction
```

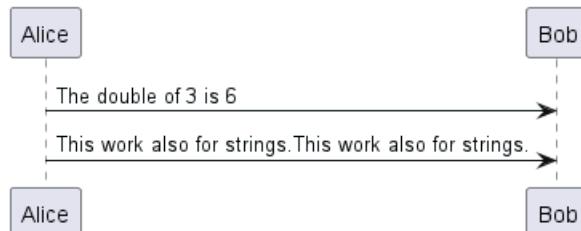
```
Alice -> Bob : The double of 3 is $double(3)
@enduml
```



It is possible to shorten simple function definition in one line:

```
@startuml
!function $double($a) !return $a + $a

Alice -> Bob : The double of 3 is $double(3)
Alice -> Bob : $double("This work also for strings.")
@enduml
```

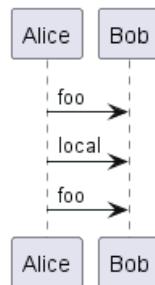


As in procedure (void function), variable are local by default (they are destroyed when the function is exited). However, you can access to global variables from function. However, you can use the `local` keyword to create a local variable if ever a global variable exists with the same name.

```
@startuml
!function $dummy()
!local $ijk = "local"
!return "Alice -> Bob : " + $ijk
!endfunction

!global $ijk = "foo"

Alice -> Bob : $ijk
$dummy()
Alice -> Bob : $ijk
@enduml
```



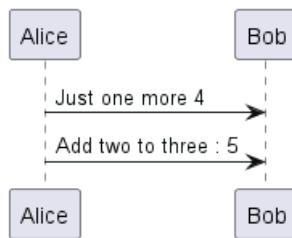
## 25.7 Default argument value

In both procedure and return functions, you can define default values for arguments.

```
@startuml
!function $inc($value, $step=1)
!return $value + $step
!endfunction

Alice -> Bob : Just one more $inc(3)
Alice -> Bob : Add two to three : $inc(3, 2)
@enduml
```



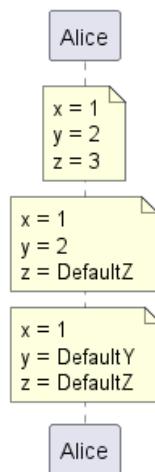


Only arguments at the end of the parameter list can have default values.

```

@startuml
!procedure defaulttest($x, $y="DefaultY", $z="DefaultZ")
note over Alice
  x = $x
  y = $y
  z = $z
end note
!endprocedure

defaulttest(1, 2, 3)
defaulttest(1, 2)
defaulttest(1)
@enduml
  
```



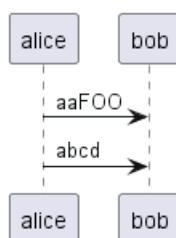
## 25.8 Unquoted procedure or function [!unquoted]

By default, you have to put quotes when you call a function or a procedure. It is possible to use the `unquoted` keyword to indicate that a function or a procedure does not require quotes for its arguments.

```

@startuml
!unquoted function id($text1, $text2="FOO") !return $text1 + $text2

alice -> bob : id(aa)
alice -> bob : id(ab,cd)
@enduml
  
```



## 25.9 Keywords arguments

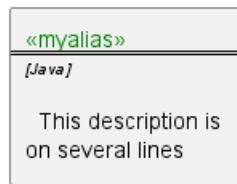
Like in Python, you can use keywords arguments :

```
@startuml
```

```
!unquoted procedure $element($alias, $description="", $label="", $technology="", $size=12, $colour="")
rectangle $alias as "
<color:$colour><$alias></color>
==$label==
//<size:$size>[$technology]</size>//

$description"
!endprocedure

$element(myalias, "This description is %newline()on several lines", $size=10, $technology="Java")
@enduml
```



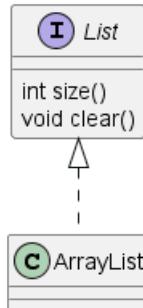
## 25.10 Including files or URL [!include, !include\_many, !include\_once]

Use the `!include` directive to include file in your diagram. Using URL, you can also include file from Internet/Intranet. Protected Internet resources can also be accessed, this is described in URL authentication.

Imagine you have the very same class that appears in many diagrams. Instead of duplicating the description of this class, you can define a file that contains the description.

```
@startuml
```

```
interface List
List : int size()
List : void clear()
List <|.. ArrayList
@enduml
```



### File List.iuml

```
interface List
List : int size()
List : void clear()
```

The file `List.iuml` can be included in many diagrams, and any modification in this file will change all diagrams that include it.



You can also put several @startuml/@enduml text block in an included file and then specify which block you want to include adding !0 where 0 is the block number. The !0 notation denotes the first diagram.

For example, if you use `!include foo.txt!1`, the second @startuml/@enduml block within `foo.txt` will be included.

You can also put an id to some @startuml/@enduml text block in an included file using `@startuml(id=MY OWN_ID)` syntax and then include the block adding `!MY OWN_ID` when including the file, so using something like `!include foo.txt!MY OWN_ID`.

By default, a file can only be included once. You can use `!include_many` instead of `!include` if you want to include some file several times. Note that there is also a `!include_once` directive that raises an error if a file is included several times.

## 25.11 Including Subpart [!startsub, !endsub, !includesub]

You can also use `!startsub NAME` and `!endsub` to indicate sections of text to include from other files using `!includesub`. For example:

**file1.puml:**

```
@startuml

A -> A : stuff1
!startsub BASIC
B -> B : stuff2
!endsub
C -> C : stuff3
!startsub BASIC
D -> D : stuff4
!endsub
@enduml
```

`file1.puml` would be rendered exactly as if it were:

**file1.puml**

```
A -> A : stuff1
B -> B : stuff2
C -> C : stuff3
D -> D : stuff4
@enduml
```

However, this would also allow you to have another `file2.puml` like this:

**file2.puml**

**file2.puml**

```
title this contains only B and D
!includesub file1.puml!BASIC
@enduml
```

This file would be rendered exactly as if:

**file2.puml**

```
title this contains only B and D
B -> B : stuff2
D -> D : stuff4
@enduml
```

## 25.12 Builtin functions [%]

Some functions are defined by default. Their name starts by %



Name	Description
%chr	Return a character from a give Unicode value
%darken	Return a darken color of a given color with some ratio
%date	Retrieve current date. You can provide an optional format for the date You can provide another optional time (on epoch format)
%dec2hex	Return the hexadecimal string (String) of a decimal value (Int)
%dirname	Retrieve current dirname
%feature	Check if some feature is available in the current PlantUML running version
%false	Return always false
%file_exists	Check if a file exists on the local filesystem
%filename	Retrieve current filename
%function_exists	Check if a function exists
%get_variable_value	Retrieve some variable value
%getenv	Retrieve environment variable value
%hex2dec	Return the decimal value (Int) of a hexadecimal string (String)
%hsl_color	Return the RGBa color from a HSL color %hsl_color(h, s, l) or %hsl_color(h, s, l, a)
%intval	Convert a String to Int
%is_dark	Check if a color is a dark one
%is_light	Check if a color is a light one
%lighten	Return a lighten color of a given color with some ratio
%load_json	Load JSON data from local file or external URL
%lower	Return a lowercase string
%newline	Return a newline
%not	Return the logical negation of an expression
%now	Return the current epoch time
%ord	Return a Unicode value from a given character
%lighten	Return a lighten color of a given color with some ratio
%reverse_color	Reverse a color using RGB
%reverse_hsluv_color	Reverse a color using HSLuv
%set_variable_value	Set a global variable
%size	Return the size of any string or JSON structure
%string	Convert an expression to String
%strlen	Calculate the length of a String
%strpos	Search a substring in a string
%substr	Extract a substring. Takes 2 or 3 arguments
%true	Return always true
%upper	Return an uppercase string
%variable_exists	Check if a variable exists
%version	Return PlantUML current version

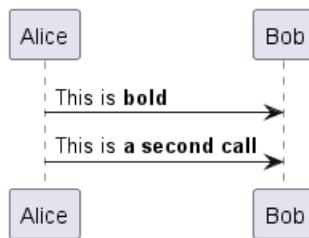
## 25.13 Logging [!log]

You can use !log to add some log output when generating the diagram. This has no impact at all on the diagram itself. However, those logs are printed in the command line's output stream. This could be useful for debug purpose.

```
@startuml
!function bold($text)
 !$result = "<b>" + $text +"</b>"
 !log Calling bold function with $text. The result is $result
 !return $result
!endfunction

Alice -> Bob : This is bold("bold")
Alice -> Bob : This is bold("a second call")
@enduml
```





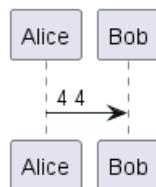
## 25.14 Memory dump [!dump\_memory]

You can use `!dump_memory` to dump the full content of the memory when generating the diagram. An optional string can be put after `!dump_memory`. This has no impact at all on the diagram itself. This could be useful for debug purpose.

```

@startuml
!function $inc($string)
!$val = %intval($string)
!log value is $val
!dump_memory
!return $val+1
!endfunction

Alice -> Bob : 4 $inc("3")
!unused = "foo"
!dump_memory EOF
@enduml
  
```



## 25.15 Assertion [!assert]

You can put assertions in your diagram.

```

@startuml
Alice -> Bob : Hello
!assert %strpos("abcdef", "cd") == 3 : "This always fails"
@enduml
  
```



**Welcome to PlantUML!**

You can start with a simple UML Diagram like:

```
Bob->Alice: Hello
```

Or

```
class Example
```

You will find more information about PlantUML syntax on <https://plantuml.com>

(Details by typing `license` keyword)



```
PlantUML 1.2023.11
[From string (line 3) ]

@startuml
Alice -> Bob : Hello
!assert %strpos("abcdef", "cd")==3 : "This always fails"
Assertion error : This always fails
```

## 25.16 Building custom library [`!import`, `!include`]

It's possible to package a set of included files into a single .zip or .jar archive. This single zip/jar can then be imported into your diagram using `!import` directive.

Once the library has been imported, you can `!include` file from this single zip/jar.

### Example:

```
@startuml
```

```
!import /path/to/customLibrary.zip
' This just adds "customLibrary.zip" in the search path

!include myFolder/myFile.iuml
' Assuming that myFolder/myFile.iuml is located somewhere
' either inside "customLibrary.zip" or on the local filesystem
```

```
...
```

## 25.17 Search path

You can specify the java property `plantuml.include.path` in the command line.

For example:

```
java -Dplantuml.include.path="c:/mydir" -jar plantuml.jar atest1.txt
```

Note the this `-D` option has to put before the `-jar` option. `-D` options after the `-jar` option will be used to define constants within plantuml preprocessor.

## 25.18 Argument concatenation [`##`]

It is possible to append text to a macro argument using the `##` syntax.

```
@startuml
!unquoted procedure COMP_TEXTGENCOMP(name)
[name] << Comp >>
interface Ifc << IfcType >> AS name##Ifc
name##Ifc - [name]
!endprocedure
COMP_TEXTGENCOMP(dummy)
@enduml
```





## 25.19 Dynamic invocation [%invoke\_procedure(), %call\_user\_func()]

You can dynamically invoke a procedure using the special `%invoke_procedure()` procedure. This procedure takes as first argument the name of the actual procedure to be called. The optional following arguments are copied to the called procedure.

For example, you can have:

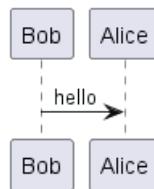
```

@startuml
!procedure $go()
    Bob -> Alice : hello
!endprocedure

!$wrapper = "$go"

%invoke_procedure($wrapper)
@enduml

```

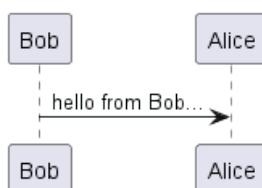


```

@startuml
!procedure $go($txt)
    Bob -> Alice : $txt
!endprocedure

%invoke_procedure("$go", "hello from Bob...")
@enduml

```



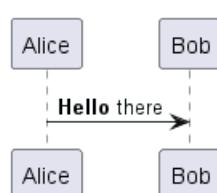
For return functions, you can use the corresponding special function `%call_user_func()`:

```

@startuml
!function bold($text)
!return "<b>" + $text + "</b>"
!endfunction

Alice -> Bob : %call_user_func("bold", "Hello") there
@enduml

```



## 25.20 Evaluation of addition depending of data types [+]

Evaluation of \$a + \$b depending of type of \$a or \$b

```
@startuml
title
<#LightBlue>|= |= $a |= $b |= <U+0025>string($a + $b) |
<#LightGray>| type | str | str | str (concatenation) |
| example |= "a" |= "b" |= %string("a" + "b") |
<#LightGray>| type | str | int | str (concatenation) |
| ex.|= "a" |= 2 |= %string("a" + 2) |
<#LightGray>| type | str | int | str (concatenation) |
| ex.|= 1 |= "b" |= %string(1 + "b") |
<#LightGray>| type | bool | str | str (concatenation) |
| ex.|= <U+0025>true() |= "b" |= %string(%true() + "b") |
<#LightGray>| type | str | bool | str (concatenation) |
| ex.|= "a" |= <U+0025>false() |= %string("a" + %false()) |
<#LightGray>| type | int | int | int (addition of int) |
| ex.|= 1 |= 2 |= %string(1 + 2) |
<#LightGray>| type | bool | int | int (addition) |
| ex.|= <U+0025>true() |= 2 |= %string(%true() + 2) |
<#LightGray>| type | int | bool | int (addition) |
| ex.|= 1 |= <U+0025>false() |= %string(1 + %false()) |
<#LightGray>| type | int | int | int (addition) |
| ex.|= 1 |= <U+0025>intval("2") |= %string(1 + %intval("2")) |
end title
@enduml
```

	\$a	\$b	%string(\$a + \$b)
type	str	str	str (concatenation)
example	"a"	"b"	ab
type	str	int	str (concatenation)
ex.	"a"	2	a2
type	str	int	str (concatenation)
ex.	1	"b"	1b
type	bool	str	str (concatenation)
ex.	%true()	"b"	1b
type	str	bool	str (concatenation)
ex.	"a"	%false()	a0
type	int	int	int (addition of int)
ex.	1	2	3
type	bool	int	int (addition)
ex.	%true()	2	3
type	int	bool	int (addition)
ex.	1	%false()	1
type	int	int	int (addition)
ex.	1	%intval("2")	3

## 25.21 Preprocessing JSON

You can extend the functionality of the current Preprocessing with JSON Preprocessing features:

- JSON Variable definition
- Access to JSON data
- Loop over JSON array

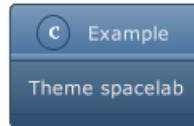
(See more details on [Preprocessing-JSON page](#))

## 25.22 Including theme [!theme]

Use the !theme directive to change the default theme of your diagram.



```
@startuml
!theme spacelab
class Example {
    Theme spacelab
}
@enduml
```



You will find more information on the dedicated page.

## 25.23 Migration notes

The current preprocessor is an update from some legacy preprocessor.

Even if some legacy features are still supported with the actual preprocessor, you should not use them any more (they might be removed in some long term future).

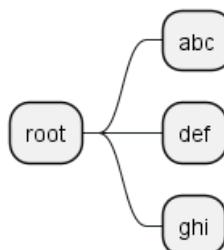
- You should not use `!define` and `!definelong` anymore. Use `!function`, `!procedure` or variable definition instead.
  - `!define` should be replaced by `return !function`
  - `!definelong` should be replaced by `!procedure`.
- `!include` now allows multiple inclusions : you don't have to use `!include_many` anymore
- `!include` now accepts a URL, so you don't need `!includeurl`
- Some features (like `%date%`) have been replaced by builtin functions (for example `%date()`)
- When calling a legacy `!definelong` macro with no arguments, you do have to use parenthesis. You have to use `my_own_definelong()` because `my_own_definelong` without parenthesis is not recognized by the new preprocessor.

Please contact us if you have any issues.

## 25.24 %Splitstr builtin function

```
@startmindmap
!$list = %splitstr("abc~def~ghi", "~")

* root
!foreach $item in $list
    ** $item
!endfor
@endmindmap
```



[Ref. QA-15374]



## 26 Unicode

The PlantUML language use *letters* to define actor, usecase and so on.

But *letters* are not only A-Z latin characters, it could be *any kind of letter from any language*.

### 26.1 Examples

```
@startuml
skinparam handwritten true
skinparam backgroundColor #EEEBDC

actor 使用者
participant "頭等艙" as A
participant "第二類" as B
participant "最後一堂課" as 別的東西

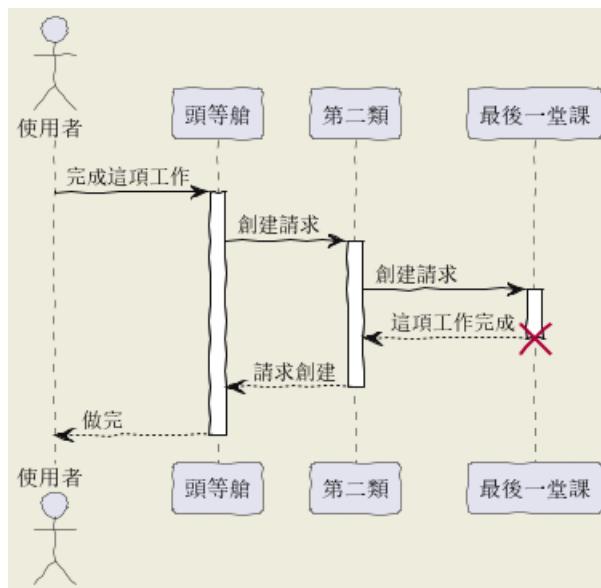
使用者 -> A: 完成這項工作
activate A

A -> B: 創建請求
activate B

B -> 別的東西: 創建請求
activate 別的東西
別的東西 --> B: 這項工作完成
destroy 別的東西

B --> A: 請求創建
deactivate B

A --> 使用者: 做完
deactivate A
@enduml
```

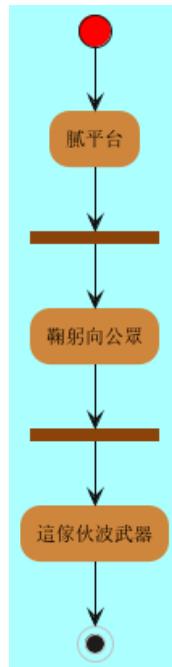


```
@startuml
(*) --> "膩平台"
--> === S1 ===
--> 鞠躬向公眾
--> === S2 ===
```



--> 這傢伙波武器  
--> (\*)

```
skinparam backgroundColor #AFFFFF
skinparam activityStartColor red
skinparam activityBarColor SaddleBrown
skinparam activityEndColor Silver
skinparam activityBackgroundColor Peru
skinparam activityBorderColor Peru
@enduml
```



@startuml

```
skinparam usecaseBackgroundColor DarkSeaGreen
skinparam usecaseArrowColor Olive
skinparam actorBorderColor black
skinparam usecaseBorderColor DarkSlateGray
```

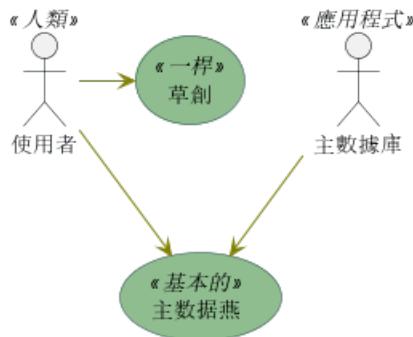
使用者 << 人類 >>  
"主數據庫" as 數據庫 << 應用程式 >>  
(草創) << 一桿 >>  
"主数据燕" as (贏余) << 基本的 >>

使用者 -> (草創)  
使用者 --> (贏余)

數據庫 --> (贏余)

@enduml





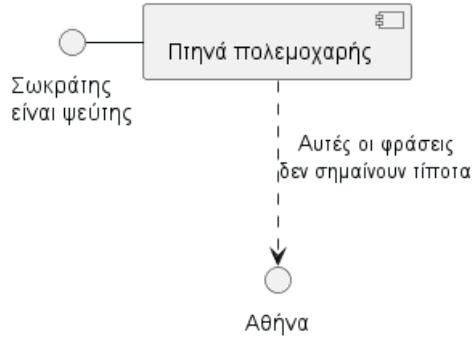
@startuml

```

() "Σ" as Σ
Σ - [Π] ..> () A : A

```

@enduml



## 26.2 Charset

The default charset used when *reading* the text files containing the UML text description is system dependent.

Normally, it should just be fine, but in some case, you may want to use another charset. For example, with the command line:

```
java -jar plantuml.jar -charset UTF-8 files.txt
```

Or, with the ant task:

```
<!-- Put images in c:/images directory -->
<target name="main">
<plantuml dir=".src" charset="UTF-8" />
```

Depending of your Java installation, the following charset should be available: ISO-8859-1, UTF-8, UTF-16BE, UTF-16LE, UTF-16.

## 26.3 Using Unicode Character on PlantUML

On PlantUML diagram, you can integrate:

- Special characters using &#XXXX; or <U+XXXX> form;
- Emoji using <:XXXXX:> or <:NameOfEmoji:>form.

## 27 PlantUML Standard Library

Welcome to the guide on PlantUML's official **Standard Library (stdlib)**. Here, we delve into this integral resource that is now included in all official releases of PlantUML, facilitating a richer diagram creation experience. The library borrows its file inclusion convention from the "C standard library", a well-established protocol in the programming world.

### 27.0.1 Standard Library Overview

The Standard Library is a repository of files and resources, constantly updated to enhance your PlantUML experience. It forms the backbone of PlantUML, offering a range of functionalities and features to explore.

### 27.0.2 Contribution from the Community

A significant portion of the library's contents are generously provided by third-party contributors. We extend our heartfelt gratitude to them for their invaluable contributions that have played a pivotal role in enriching the library.

We encourage users to delve into the abundant resources the Standard Library offers, to not only enhance their diagram crafting experience but also possibly contribute and be a part of this collaborative endeavor.

## 27.1 List of Standard Library

You can list standard library folders using the special diagram:

```
@startuml  
stdlib  
@enduml
```



**archimate**

Version 1.1.0

Delivered by <https://github.com/plantuml-stdlib/Archimate-PlantUML>**aws**

Version 18.02.22

Delivered by <https://github.com/milo-minderbinder/AWS-PlantUML>**awslib**

Version 14.0.0

Delivered by <https://github.com/awslabs/aws-icons-for-plantuml>**azure**

Version 2.2.0

Delivered by <https://github.com/plantuml-stdlib/Azure-PlantUML>**c4**

Version 2.8.0

Delivered by <https://github.com/plantuml-stdlib/C4-PlantUML>**classy**

Version 1.0.0

Delivered by <https://github.com/james-gadrow-kr/classy-plantuml>**classy-c4**

Version 1.0.0

Delivered by <https://github.com/james-gadrow-kr/classy-c4>**cloudinsight**

Version 1.0.0

Delivered by <https://github.com/plantuml-stdlib/cicon-plantuml-sprites>**cloudogu**

Version 1.0.2

Delivered by <https://github.com/cloudogu/plantuml-cloudogu-sprites>**domainstory**

Version 0.3

Delivered by <https://github.com/johthor/DomainStory-PlantUML>**elastic**

Version 0.0.1

Delivered by <https://github.com/Crashedmind/PlantUML-Elastic-icons>**kubernetes**

Version 5.3.45

Delivered by <https://github.com/plantuml-stdlib/plantuml-kubernetes-sprites>**logos**

Version 1.1.0

Delivered by <https://github.com/plantuml-stdlib/gilbarbara-plantuml-sprites>**material**

Version 0.0.1

Delivered by <https://github.com/Templarian/MaterialDesign>**office**

Version 1.0.0

Delivered by <https://github.com/Roemer/plantuml-office>**osa**

Version 0.0.1

Delivered by <https://github.com/Crashedmind/PlantUML-opensecurityarchitecture-icons>**tupadr3**

Version 2.4.0

Delivered by <https://github.com/tupadr3/plantuml-icon-font-sprites>

It is also possible to use the command line `java -jar plantuml.jar -stdlib` to display the same list.

Finally, you can extract the full standard library sources using `java -jar plantuml.jar -extractstdlib`. All files will be extracted in the folder `stdlib`.

Sources used to build official PlantUML releases are hosted here <https://github.com/plantuml/plantuml>



stdlib. You can create Pull Request to update or add some library if you find it relevant.

## 27.2 ArchiMate [archimate]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/archimate">https://github.com/plantuml/plantuml-stdlib/tree/master/archimate</a>
src	<a href="https://github.com/ebbpeter/Archimate-PlantUML">https://github.com/ebbpeter/Archimate-PlantUML</a>
orig	<a href="https://en.wikipedia.org/wiki/ArchiMate">https://en.wikipedia.org/wiki/ArchiMate</a>

This repository contains ArchiMate PlantUML macros and other includes for creating Archimate Diagrams easily and consistently.

```
@startuml
!include <archimate/Archimate>

title Archimate Sample - Internet Browser

' Elements
Business_Object(businessObject, "A Business Object")
Business_Process(someBusinessProcess, "Some Business Process")
Business_Service(itSupportService, "IT Support for Business (Application Service)")

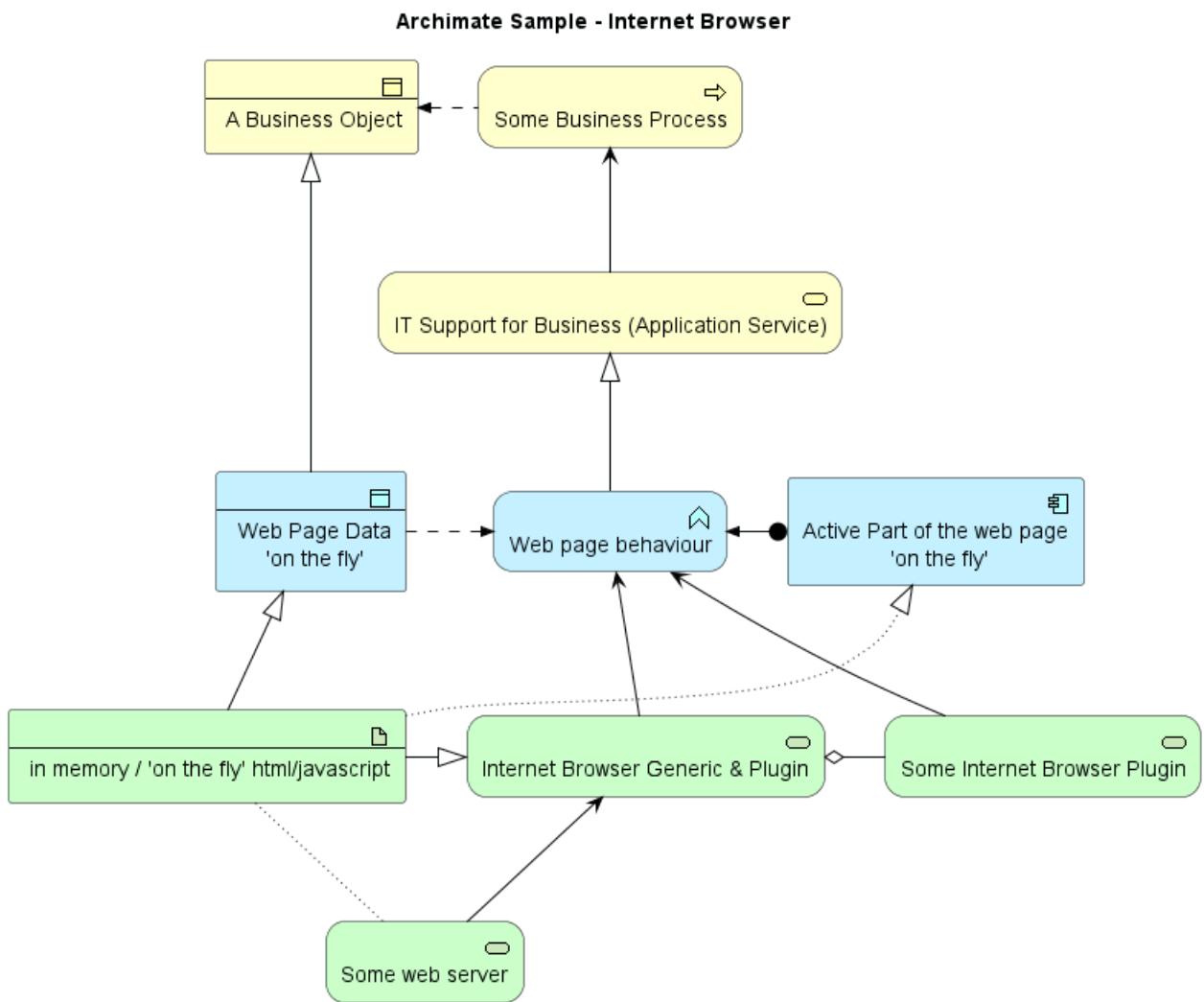
Application_DataObject(dataObject, "Web Page Data \n 'on the fly'")
Application_Function(webpageBehaviour, "Web page behaviour")
Application_Component(ActivePartWebPage, "Active Part of the web page \n 'on the fly')

Technology_Artifact(inMemoryItem, "in memory / 'on the fly' html/javascript")
Technology_Service(internetBrowser, "Internet Browser Generic & Plugin")
Technology_Service(internetBrowserPlugin, "Some Internet Browser Plugin")
Technology_Service(webServer, "Some web server")

'Relationships
Rel_Flow_Left(someBusinessProcess, businessObject, "")
Rel_Serving_Up(itSupportService, someBusinessProcess, "")
Rel_Specialization_Up(webpageBehaviour, itSupportService, "")
Rel_Flow_Right(dataObject, webpageBehaviour, "")
Rel_Specialization_Up(dataObject, businessObject, "")
Rel_Assignment_Left(ActivePartWebPage, webpageBehaviour, "")
Rel_Specialization_Up(inMemoryItem, dataObject, "")
Rel_Realization_Up(inMemoryItem, ActivePartWebPage, "")
Rel_Specialization_Right(inMemoryItem, internetBrowser, "")
Rel_Serving_Up(internetBrowser, webpageBehaviour, "")
Rel_Serving_Up(internetBrowserPlugin, webpageBehaviour, "")
Rel_Aggregation_Right(internetBrowser, internetBrowserPlugin, "")
Rel_Access_Up(webServer, inMemoryItem, "")
Rel_Serving_Up(webServer, internetBrowser, "")

@enduml
```





### 27.2.1 List possible sprites

You can list all possible sprites for ArchiMate using the following diagram:

```
@startuml
listsprite
@enduml
```





## 27.3 Amazon Labs AWS Library [awslib]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/awslib">https://github.com/plantuml/plantuml-stdlib/tree/master/awslib</a>
src	<a href="https://github.com/awslabs/aws-icons-for-plantuml">https://github.com/awslabs/aws-icons-for-plantuml</a>
orig	<a href="https://aws.amazon.com/en/architecture/icons/">https://aws.amazon.com/en/architecture/icons/</a>

The Amazon Labs AWS library provides PlantUML sprites, macros, and other includes for Amazon Web Services (AWS) services and resources.

Used to create PlantUML diagrams with AWS components. All elements are generated from the official AWS Architecture Icons and when combined with PlantUML and the C4 model, are a great way to communicate your design, deployment, and topology as code.

```

@startuml
!include <awslib/AWSCommon>
!include <awslib/InternetOfThings/IoTRule>
!include <awslib/Analytics/KinesisDataStreams>
!include <awslib/ApplicationIntegration/SimpleQueueService>

left to right direction

agent "Published Event" as event #fff

IoTRule(iotRule, "Action Error Rule", "error if Kinesis fails")
KinesisDataStreams(eventStream, "IoT Events", "2 shards")
SimpleQueueService(errorQueue, "Rule Error Queue", "failed Rule actions")

event --> iotRule : JSON message
iotRule --> eventStream : messages
iotRule --> errorQueue : Failed action message
@enduml

```



## 27.4 Azure library [azure]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/azure">https://github.com/plantuml/plantuml-stdlib/tree/master/azure</a>
src	<a href="https://github.com/RicardoNiepel/Azure-PlantUML/">https://github.com/RicardoNiepel/Azure-PlantUML/</a>
orig	Microsoft Azure

The Azure library consists of Microsoft Azure icons.

Use it by including the file that contains the sprite, eg: `!include <azure/Analytics/AzureEventHub>`. When imported, you can use the sprite as normally you would, using `<$sprite_name>`.

You may also include the `AzureCommon.puml` file, eg: `!include <azure/AzureCommon>`, which contains helper macros defined. With the `AzureCommon.puml` imported, you can use the `NAME_OF_SPRITE(parameters...)` macro.

Example of usage:

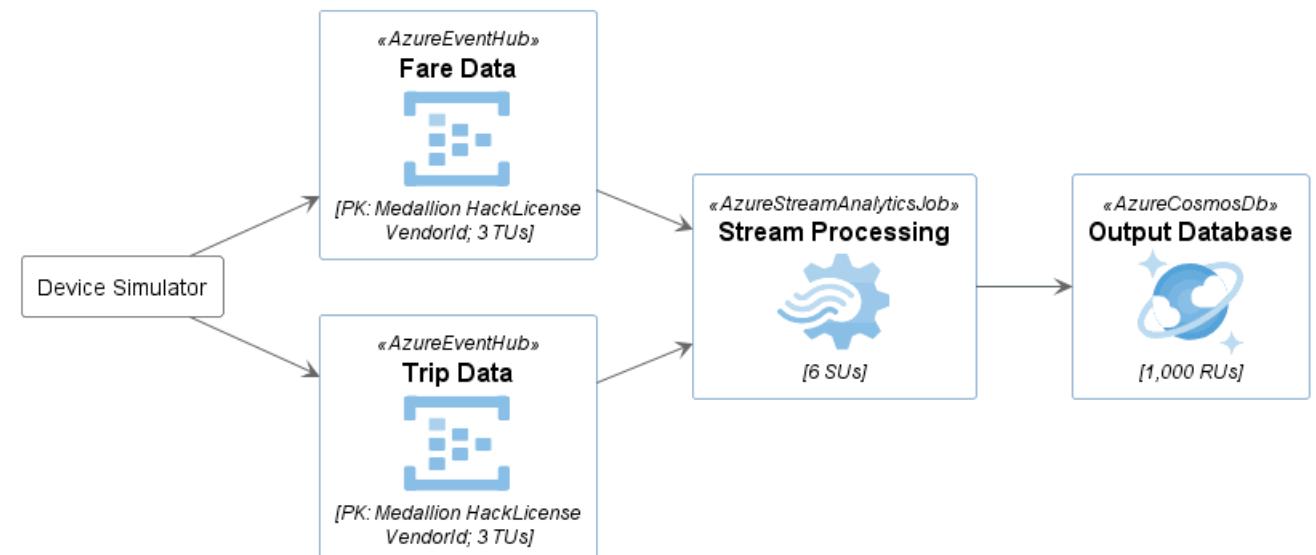
```
@startuml
!include <azure/AzureCommon>
!include <azure/Analytics/AzureEventHub>
!include <azure/Analytics/AzureStreamAnalyticsJob>
!include <azure/Databases/AzureCosmosDb>
```

left to right direction

```
agent "Device Simulator" as devices #fff
```

```
AzureEventHub(fareDataEventHub, "Fare Data", "PK: Medallion HackLicense VendorId; 3 TUs")
AzureEventHub(tripDataEventHub, "Trip Data", "PK: Medallion HackLicense VendorId; 3 TUs")
AzureStreamAnalyticsJob(streamAnalytics, "Stream Processing", "6 SUs")
AzureCosmosDb(outputCosmosDb, "Output Database", "1,000 RUs")
```

```
devices --> fareDataEventHub
devices --> tripDataEventHub
fareDataEventHub --> streamAnalytics
tripDataEventHub --> streamAnalytics
streamAnalytics --> outputCosmosDb
@enduml
```



## 27.5 C4 Library [C4]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/C4">https://github.com/plantuml/plantuml-stdlib/tree/master/C4</a>
src	<a href="https://github.com/plantuml-stdlib/C4-PlantUML">https://github.com/plantuml-stdlib/C4-PlantUML</a>
orig	<a href="https://en.wikipedia.org/wiki/C4_model">https://en.wikipedia.org/wiki/C4_model</a>

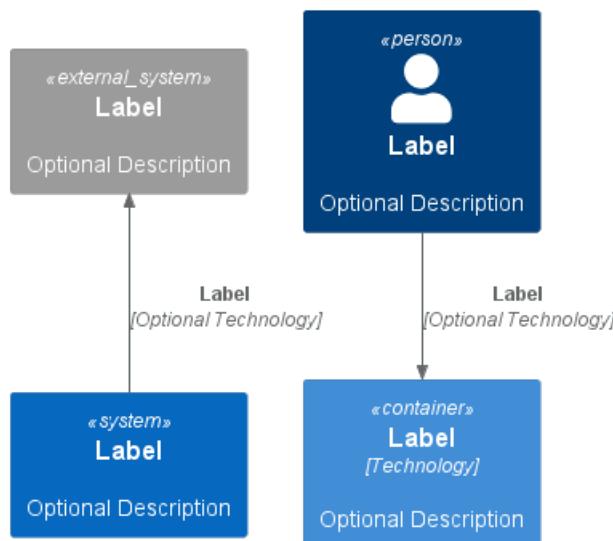
```
@startuml
!include <C4/C4_Container>

Person(personAlias, "Label", "Optional Description")
Container(containerAlias, "Label", "Technology", "Optional Description")
System(systemAlias, "Label", "Optional Description")

System_Ext(extSystemAlias, "Label", "Optional Description")

Rel(personAlias, containerAlias, "Label", "Optional Technology")

Rel_U(systemAlias, extSystemAlias, "Label", "Optional Technology")
@enduml
```



## 27.6 Cloud Insight [cloudinsight]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/cloudinsight">https://github.com/plantuml/plantuml-stdlib/tree/master/cloudinsight</a>
src	<a href="https://github.com/rabelenda/cicon-plantuml-sprites">https://github.com/rabelenda/cicon-plantuml-sprites</a>
orig	Cloudinsight icons

This repository contains PlantUML sprites generated from Cloudinsight icons, which can easily be used in PlantUML diagrams for nice visual representation of popular technologies.

```
@startuml
!include <cloudinsight/tomcat>
!include <cloudinsight/kafka>
!include <cloudinsight/java>
!include <cloudinsight/cassandra>

title Cloudinsight sprites example

skinparam monochrome true

rectangle "<$tomcat>\nwebapp" as webapp
```



```

queue "<$kafka>" as kafka
rectangle "<$java>\nddaemon" as daemon
database "<$cassandra>" as cassandra

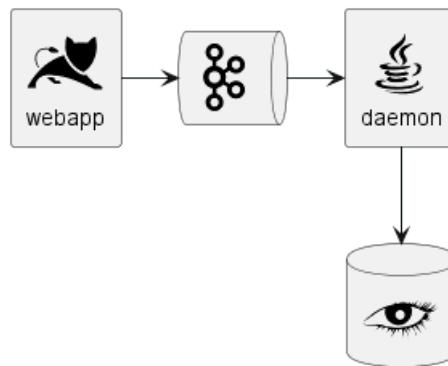
```

```

webapp -> kafka
kafka -> daemon
daemon --> cassandra
@enduml

```

#### Cloudinsight sprites example



## 27.7 Cloudogu [cloudogu]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/cloudogu">https://github.com/plantuml/plantuml-stdlib/tree/master/cloudogu</a>
src	<a href="https://github.com/cloudogu/plantuml-cloudogu-sprites">https://github.com/cloudogu/plantuml-cloudogu-sprites</a>
orig	<a href="https://cloudogu.com">https://cloudogu.com</a>

The Cloudogu library provides PlantUML sprites, macros, and other includes for Cloudogu services and resources.

```

@startuml
!include <cloudogu/common>
!include <cloudogu/dogus/jenkins>
!include <cloudogu/dogus/cloudogu>
!include <cloudogu/dogus/scm>
!include <cloudogu/dogus/smeagol>
!include <cloudogu/dogus/nexus>
!include <cloudogu/tools/k8s>

node "Cloudogu Ecosystem" <<$cloudogu>> {
    DOGU_JENKINS(jenkins, Jenkins) #ffffff
    DOGU_SCM(scm, SCM-Manager) #ffffff
    DOGU_SMEAGOL(smeagol, Smeagol) #ffffff
    DOGU_NEXUS(nexus, Nexus) #ffffff
}

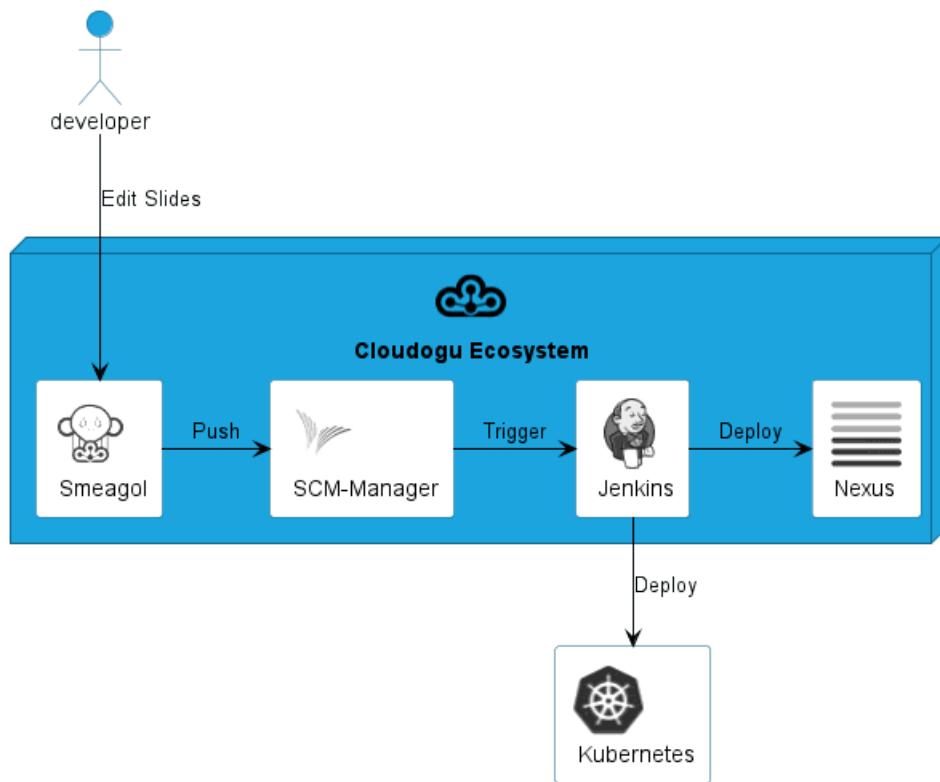
TOOL_K8S(k8s, Kubernetes) #ffffff

actor developer

developer --> smeagol : "Edit Slides"
smeagol -> scm : Push
scm -> jenkins : Trigger
jenkins -> nexus : Deploy
jenkins --> k8s : Deploy

```

@enduml

**All cloudogu sprites**

See all possible cloudogu sprites on plantuml-cloudogu-sprites.

## 27.8 Elastic library [elastic]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/elastic">https://github.com/plantuml/plantuml-stdlib/tree/master/elastic</a>
src	<a href="https://github.com/Crashedmind/PlantUML-Elastic-icons">https://github.com/Crashedmind/PlantUML-Elastic-icons</a>
orig	Elastic

The Elastic library consists of Elastic icons. It is similar in use to the AWS and Azure libraries (it used the same tool to create them).

Use it by including the file that contains the sprite, eg: `!include elastic/elasticsearch/elasticsearch`. When imported, you can use the sprite as normally you would, using `<$sprite_name>`.

You may also include the `common.puml` file, eg: `!include <elastic/common>`, which contains helper macros defined. With the `common.puml` imported, you can use the `NAME//OF//SPRITE(parameters...)` macro.

Example of usage:

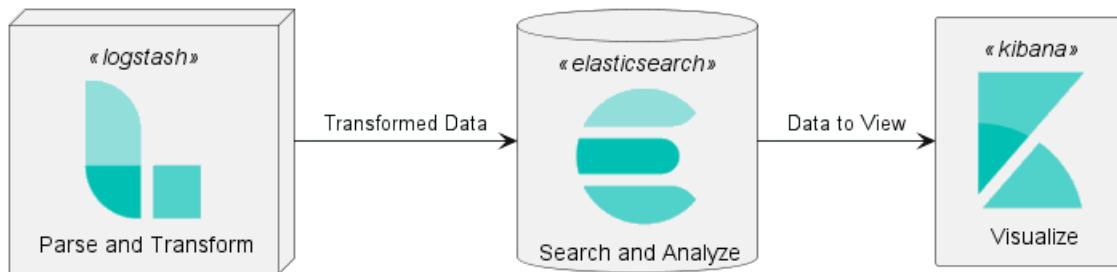
```

@startuml
!include <elastic/common>
!include <elastic/elasticsearch/elasticsearch>
!include <elastic/logstash/logstash>
!include <elastic/kibana/kibana>

ELASTICSEARCH(ElasticSearch, "Search and Analyze", database)
LOGSTASH(Logstash, "Parse and Transform", node)
KIBANA(Kibana, "Visualize", agent)

Logstash -right-> Elasticsearch: Transformed Data
  
```

ElasticSearch -right-> Kibana: Data to View  
 @enduml



### All Elastic Sprite Set

```

@startuml
'Adapted from https://github.com/Crashedmind/PlantUML-Elastic-icons/blob/master/All.puml

'Elastic stuff here
'=====

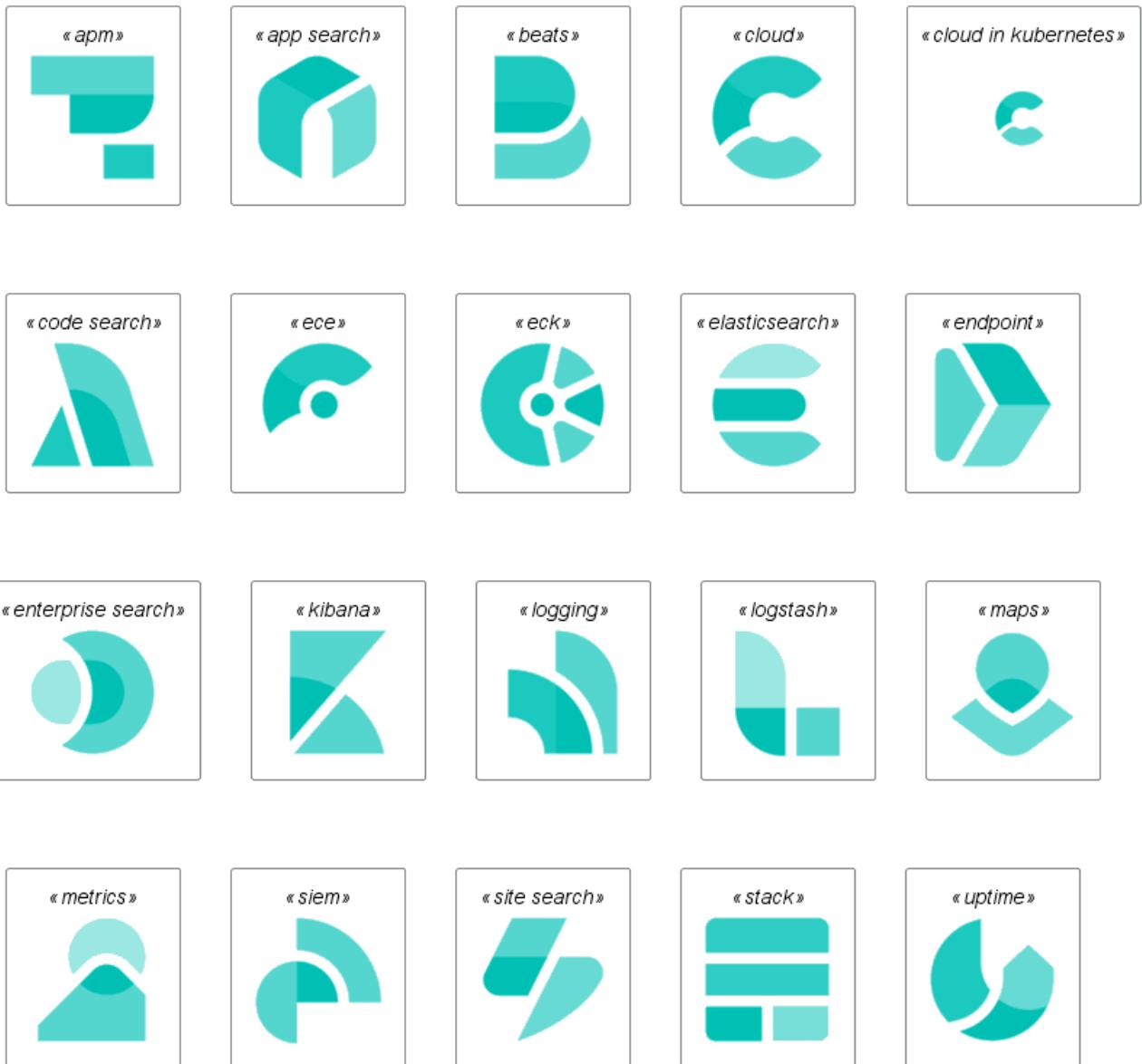
!include <elastic/common>
!include <elastic/apm/apm>
!include <elastic/app_search/app_search>
!include <elastic/beats/beats>
!include <elastic/cloud/cloud>
!include <elastic/cloud_in_kubernetes/cloud_in_kubernetes>
!include <elastic/code_search/code_search>
!include <elastic/ece/ece>
!include <elastic/eck/eck>
' Beware of the difference between Crashedmind and plantuml-stdlib version: with '_' usage!
!include <elastic/elasticsearch/elasticsearch>
!include <elastic/endpoint/endpoint>
!include <elastic/enterprise_search/enterprise_search>
!include <elastic/kibana/kibana>
!include <elastic/logging/logging>
!include <elastic/logstash/logstash>
!include <elastic/maps/maps>
!include <elastic/metrics/metrics>
!include <elastic/siem/siem>
!include <elastic/site_search/site_search>
!include <elastic/stack/stack>
!include <elastic/uptime/uptime>

skinparam agentBackgroundColor White

APM(apm)
APP_SEARCH(app_search)
BEATS(beats)
CLOUD(cloud)
CLOUD_IN_KUBERNETES(cloud_in_kubernetes)
CODE_SEARCH(code_search)
ECE(ece)
ECK(eck)
ELASTICSEARCH(elastic_search)
ENDPOINT(endpoint)
ENTERPRISE_SEARCH(enterprise_search)
KIBANA(kibana)
LOGGING(logging)
  
```



```
LOGSTASH(logstash)
MAPS.maps
METRICS(metrics)
SIEM(siem)
SITE_SEARCH(site_search)
STACK(stack)
UPTIME(uptime)
@enduml
```



## 27.9 Google Material Icons [material]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/material">https://github.com/plantuml/plantuml-stdlib/tree/master/material</a>
src	<a href="https://github.com/Templarian/MaterialDesign">https://github.com/Templarian/MaterialDesign</a>
orig	Material Design Icons

This library consists of a free Material style icons from Google and other artists.

Use it by including the file that contains the sprite, eg: `!include <material/ma_folder_move>`. When imported, you can use the sprite as normally you would, using `<$ma_sprite_name>`. Notice that this



library requires an `ma_` prefix on sprites names, this is to avoid clash of names if multiple sprites have the same name on different libraries.

You may also include the `common.puml` file, eg: `!include <material/common>`, which contains helper macros defined. With the `common.puml` imported, you can use the `MA_NAME_OF_SPRITE(parameters...)` macro, note again the use of the prefix `MA_`.

Example of usage:

```
@startuml
!include <material/common>
' To import the sprite file you DON'T need to place a prefix!
!include <material/folder_move>

MA_FOLDER_MOVE(Red, 1, dir, rectangle, "A label")
@enduml
```



#### Notes:

When mixing sprites macros with other elements you may get a syntax error if, for example, trying to add a rectangle along with classes. In those cases, add `{` and `}` after the macro to create the empty rectangle.

Example of usage:

```
@startuml
!include <material/common>
' To import the sprite file you DON'T need to place a prefix!
!include <material/folder_move>

MA_FOLDER_MOVE(Red, 1, dir, rectangle, "A label") {
}

class foo {
    bar
}
@enduml
```



## 27.10 Kubernetes [kubernetes]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/kubernetes">https://github.com/plantuml/plantuml-stdlib/tree/master/kubernetes</a>
src	<a href="https://github.com/michiel/plantuml-kubernetes-sprites">https://github.com/michiel/plantuml-kubernetes-sprites</a>
orig	Kubernetes

```
@startuml
!include <kubernetes/k8s-sprites-unlabeled-25pct>
package "Infrastructure" {
    component "<$master>\nmaster" as master
```



```

component "<$etcd>\netcd" as etcd
component "<$node>\nnode" as node
}
@enduml

```



## 27.11 Logos [logos]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/logos">https://github.com/plantuml/plantuml-stdlib/tree/master/logos</a>
src	<a href="https://github.com/plantuml-stdlib/gilbarbara-plantuml-sprites">https://github.com/plantuml-stdlib/gilbarbara-plantuml-sprites</a>
orig	Gil Barbara's logos

This repository contains PlantUML sprites generated from Gil Barbara's logos, which can easily be used in PlantUML diagrams for nice visual aid.

```

@startuml
!include <logos/flask>
!include <logos/kafka>
!include <logos/kotlin>
!include <logos/cassandra>

title Gil Barbara's logos example

skinparam monochrome true

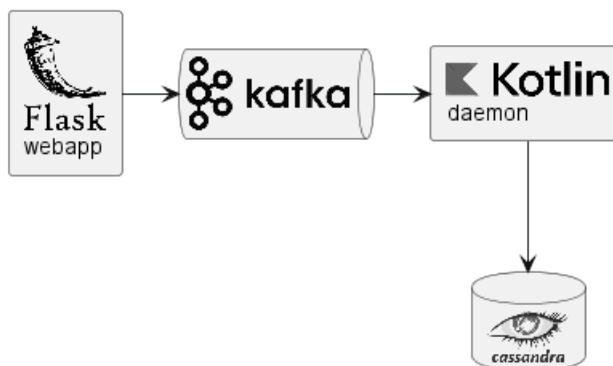
rectangle "<$flask>\nwebapp" as webapp
queue "<$kafka>" as kafka
rectangle "<$kotlin>\ndaemon" as daemon
database "<$cassandra>" as cassandra

webapp -> kafka
kafka -> daemon
daemon --> cassandra
@enduml

```



Gil Barbara's logos example



```

@startuml
scale 0.7
!include <logos/apple-pay>
!include <logos/dinersclub>
!include <logos/discover>
!include <logos/google-pay>
!include <logos/jcb>
!include <logos/maestro>
!include <logos/mastercard>
!include <logos/paypal>
!include <logos/unionpay>
!include <logos/visaelectron>
!include <logos/visa>
' ...

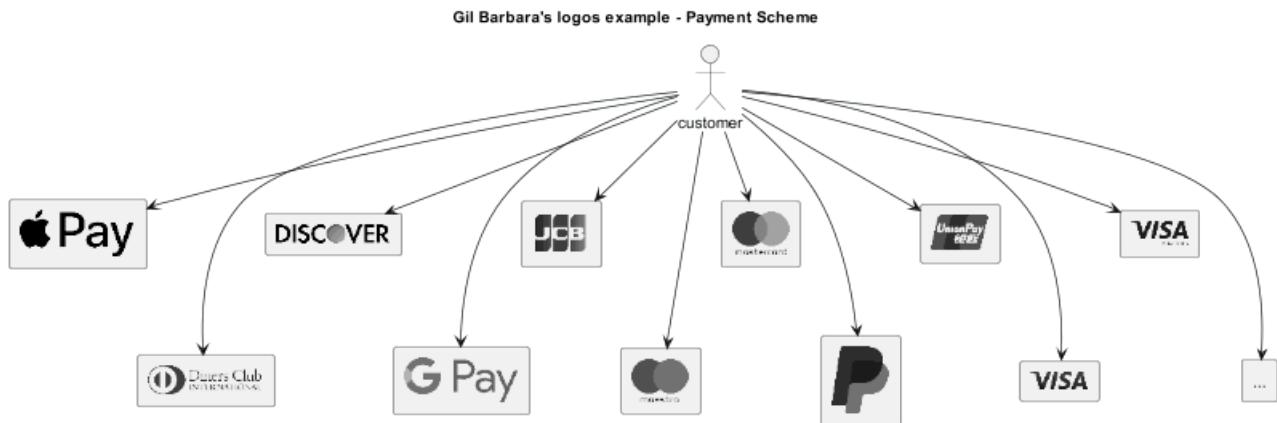
title Gil Barbara's logos example - **Payment Scheme**

actor customer
rectangle "<$apple-pay>" as ap
rectangle "<$dinersclub>" as dc
rectangle "<$discover>" as d
rectangle "<$google-pay>" as gp
rectangle "<$jcb>" as j
rectangle "<$maestro>" as ma
rectangle "<$mastercard>" as m
rectangle "<$paypal>" as p
rectangle "<$unionpay>" as up
rectangle "<$visa>" as v
rectangle "<$visaelectron>" as ve
rectangle "..." as etc

customer --> ap
customer ---> dc
customer --> d
customer ---> gp
customer --> j
customer ---> ma
customer --> m
customer ---> p
customer --> up
customer ---> v
customer --> ve
customer ---> etc
  
```



```
@enduml
```



## 27.12 Office [office]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/office">https://github.com/plantuml/plantuml-stdlib/tree/master/office</a>
src	<a href="https://github.com/Roemer/plantuml-office">https://github.com/Roemer/plantuml-office</a>
orig	

There are sprites (\*.puml) and colored png icons available. Be aware that the sprites are all only monochrome even if they have a color in their name (due to automatically generating the files). You can either color the sprites with the macro (see examples below) or directly use the fully colored pngs. See the following examples on how to use the sprites, the pngs and the macros.

Example of usage:

```

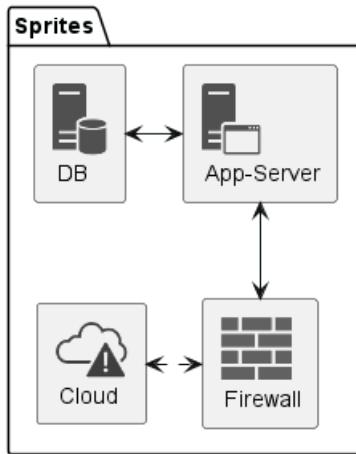
@startuml
!include <tupadr3/common>

!include <office/Servers/database_server>
!include <office/Servers/application_server>
!include <office/Concepts/firewall_orange>
!include <office/Clouds/cloud_disaster_red>

title Office Icons Example

package "Sprites" {
    OFF_DATABASE_SERVER(db,DB)
    OFF_APPLICATION_SERVER(app,App-Server)
    OFF_FIREWALL_ORANGE(fw,Firewall)
    OFF_CLOUD_DISASTER_RED(cloud,Cloud)
    db <-> app
    app <--> fw
    fw <.left.> cloud
}
@enduml
  
```



**Office Icons Example**

```

@startuml
!include <tupadr3/common>

!include <office/servers/database_server>
!include <office/servers/application_server>
!include <office/Concepts/firewall_orange>
!include <office/Clouds/cloud_disaster_red>

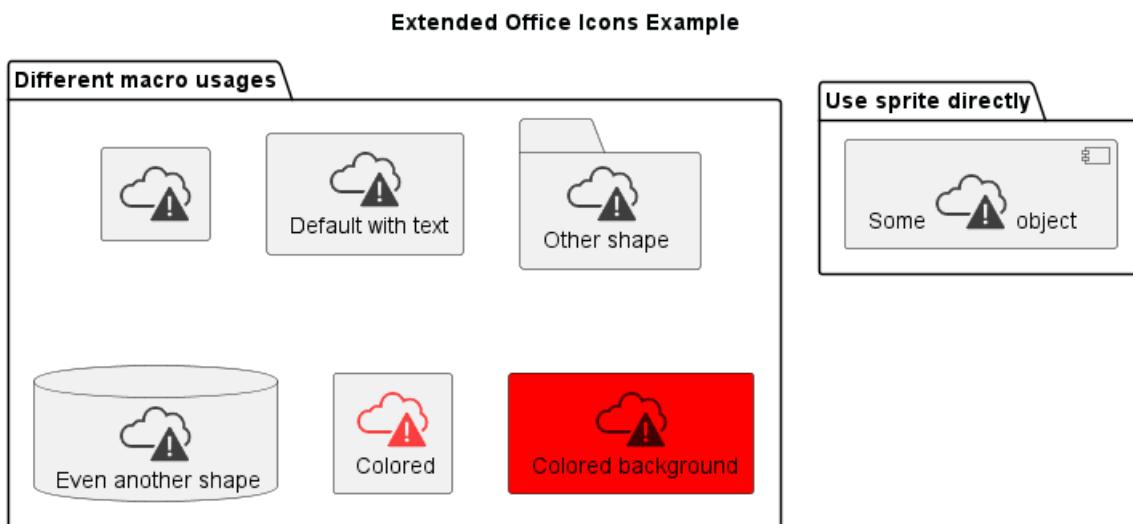
' Used to center the label under the images
skinparam defaultTextAlignment center

title Extended Office Icons Example

package "Use sprite directly" {
    [Some <$cloud_disaster_red> object]
}

package "Different macro usages" {
    OFF_CLOUD_DISASTER_RED(cloud1)
    OFF_CLOUD_DISASTER_RED(cloud2,Default with text)
    OFF_CLOUD_DISASTER_RED(cloud3,Other shape,Folder)
    OFF_CLOUD_DISASTER_RED(cloud4,Even another shape,Database)
    OFF_CLOUD_DISASTER_RED(cloud5,Colored,Rectangle, red)
    OFF_CLOUD_DISASTER_RED(cloud6,Colored background) #red
}
@enduml
  
```





## 27.13 Open Security Architecture (OSA) [osa]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/osa">https://github.com/plantuml/plantuml-stdlib/tree/master/osa</a>
src	<a href="https://github.com/Crashedmind/PlantUML-opensecurityarchitecture-icons">https://github.com/Crashedmind/PlantUML-opensecurityarchitecture-icons</a>
orig	<a href="https://www.opensecurityarchitecture.org">https://www.opensecurityarchitecture.org</a>

```
@startuml
```

```
'Adapted from https://github.com/Crashedmind/PlantUML-opensecurityarchitecture-icons/blob/master/all
scale .5
!include <osa/arrow/green/left/left>
!include <osa/arrow/yellow/right/right>
!include <osa/awareness/awareness>
!include <osa/contract/contract>
!include <osa/database/database>
!include <osa/desktop/desktop>
!include <osa/desktop/imac/imac>
!include <osa/device_music/device_music>
!include <osa/device_scanner/device_scanner>
!include <osa/device_usb/device_usb>
!include <osa/device_wireless_router/device_wireless_router>
!include <osa/disposal/disposal>
!include <osa/drive_optical/drive_optical>
!include <osa/firewall/firewall>
!include <osa/hub/hub>
!include <osa/ics/drive/drive>
!include <osa/ics/plc/plc>
!include <osa/ics/thermometer/thermometer>
!include <osa/id/card/card>
!include <osa/laptop/laptop>
!include <osa/lifecycle/lifecycle>
!include <osa/lightning/lightning>
!include <osa/media_flash/media_flash>
!include <osa/media_optical/media_optical>
!include <osa/media_tape/media_tape>
!include <osa/mobile/pda/pda>
!include <osa/padlock/padlock>
!include <osa/printer/printer>
!include <osa/site_branch/site_branch>
!include <osa/site_factory/site_factory>
!include <osa/vpn/vpn>
```



```
!include <osa/wireless/network/network>

rectangle "OSA" {
rectangle "Left:\n <$left>" 
rectangle "Right:\n <$right>" 
rectangle "Awareness:\n <$awareness>" 
rectangle "Contract:\n <$contract>" 
rectangle "Database:\n <$database>" 
rectangle "Desktop:\n <$desktop>" 
rectangle "Imac:\n <$imac>" 
rectangle "Device_music:\n <$device_music>" 
rectangle "Device_scanner:\n <$device_scanner>" 
rectangle "Device_usb:\n <$device_usb>" 
rectangle "Device_wireless_router:\n <$device_wireless_router>" 
rectangle "Disposal:\n <$disposal>" 
rectangle "Drive_optical:\n <$drive_optical>" 
rectangle "Firewall:\n <$firewall>" 
rectangle "Hub:\n <$hub>" 
rectangle "Drive:\n <$drive>" 
rectangle "Plc:\n <$plc>" 
rectangle "Thermometer:\n <$thermometer>" 
rectangle "Card:\n <$card>" 
rectangle "Laptop:\n <$laptop>" 
rectangle "Lifecycle:\n <$lifecycle>" 
rectangle "Lightning:\n <$lightning>" 
rectangle "Media_flash:\n <$media_flash>" 
rectangle "Media_optical:\n <$media_optical>" 
rectangle "Media_tape:\n <$media_tape>" 
rectangle "Pda:\n <$pda>" 
rectangle "Padlock:\n <$padlock>" 
rectangle "Printer:\n <$printer>" 
rectangle "Site_branch:\n <$site_branch>" 
rectangle "Site_factory:\n <$site_factory>" 
rectangle "Vpn:\n <$vpn>" 
rectangle "Network:\n <$network>" 
}
@enduml
```



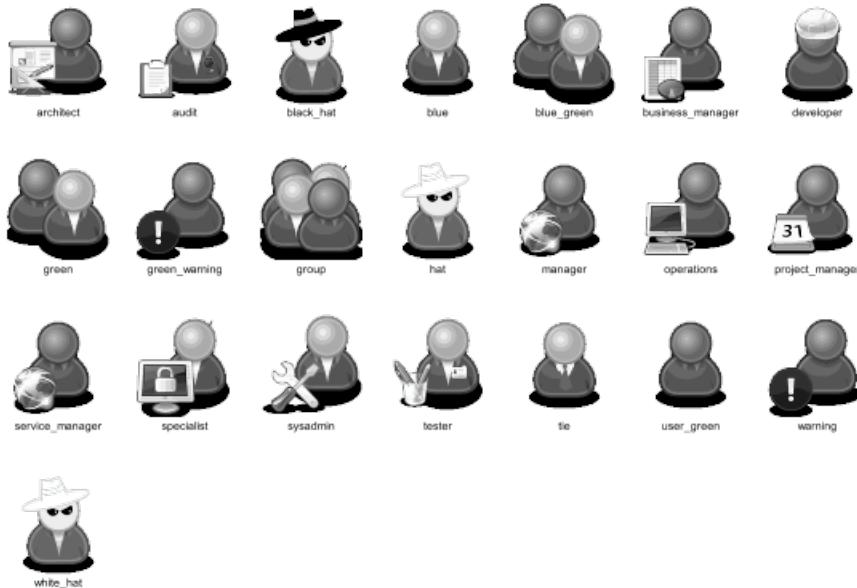


```
@startuml
scale .5
!include <osa/user/audit/audit>
'beware of 'hat-sprite'
!include <osa/user/black/hat/hat-sprite>
!include <osa/user/blue/blue>
!include <osa/user/blue/security/specialist/specialist>
!include <osa/user/blue/sysadmin/sysadmin>
!include <osa/user/blue/tester/tester>
!include <osa/user/blue/tie/tie>
!include <osa/user/green/architect/architect>
!include <osa/user/green/business/manager/manager>
!include <osa/user/green/developer/developer>
!include <osa/user/green/green>
!include <osa/user/green/operations/operations>
!include <osa/user/green/project/manager/manager>
!include <osa/user/green/service/manager/manager>
!include <osa/user/green/warning/warning>
!include <osa/user/large/group/group>
!include <osa/users/blue/green/green>
!include <osa/user/white/hat/hat>
```

listsprites



```
@enduml
```



## 27.14 Tupadr3 library [tupadr3]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/tupadr3">https://github.com/plantuml/plantuml-stdlib/tree/master/tupadr3</a>
src	<a href="https://github.com/tupadr3/plantuml-icon-font-sprites">https://github.com/tupadr3/plantuml-icon-font-sprites</a>
orig	<a href="https://github.com/tupadr3/plantuml-icon-font-sprites#icon-sets">https://github.com/tupadr3/plantuml-icon-font-sprites#icon-sets</a>

This library contains several libraries of icons (including Devicons and Font Awesome).

Use it by including the file that contains the sprite, eg: `!include <font-awesome/common>`. When imported, you can use the sprite as normally you would, using `<$sprite_name>`.

You may also include the `common.puml` file, eg: `!include <font-awesome/common>`, which contains helper macros defined. With the `common.puml` imported, you can use the `NAME_OF_SPRITE(parameters...)` macro.

Example of usage:

```
@startuml
!include <tupadr3/common>
!include <tupadr3/font-awesome/server>
!include <tupadr3/font-awesome/database>
```

```
title Styling example
```

```
FA_SERVER(web1,web1) #Green
FA_SERVER(web2,web2) #Yellow
FA_SERVER(web3,web3) #Blue
FA_SERVER(web4,web4) #YellowGreen

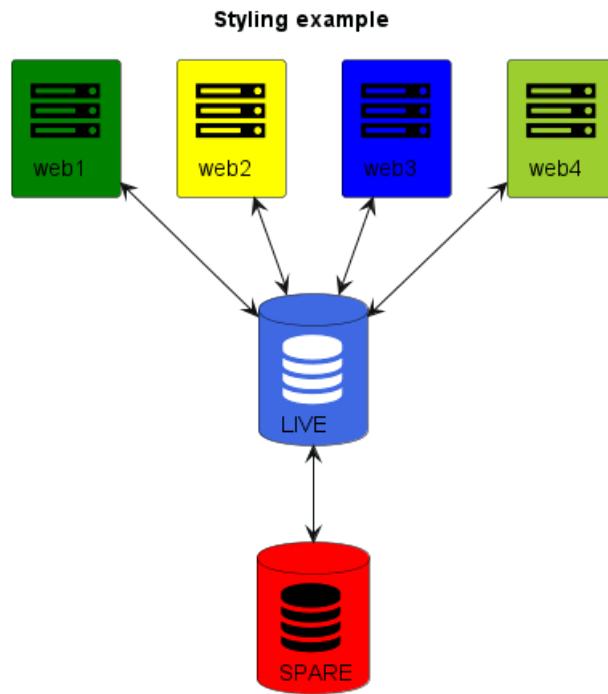
FA_DATABASE(db1,LIVE,database,white) #RoyalBlue
FA_DATABASE(db2,SPARE,database) #Red
```

```
db1 <--> db2
```

```
web1 <--> db1
web2 <--> db1
web3 <--> db1
web4 <--> db1
```



@enduml



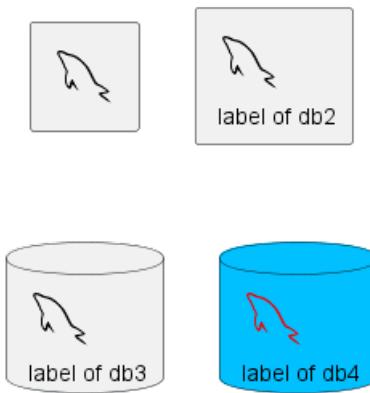
@startuml

!include &lt;tupadr3/common&gt;

!include &lt;tupadr3/devicons/mysql&gt;

```

DEV_MYSQL(db1)
DEV_MYSQL(db2,label of db2)
DEV_MYSQL(db3,label of db3,database)
DEV_MYSQL(db4,label of db4,database,red) #DeepSkyBlue
@enduml
  
```



## 27.15 AWS library [aws]

Type	Link
stdlib	<a href="https://github.com/plantuml/plantuml-stdlib/tree/master/aws">https://github.com/plantuml/plantuml-stdlib/tree/master/aws</a>
src	<a href="https://github.com/milo-minderbinder/AWS-PlantUML">https://github.com/milo-minderbinder/AWS-PlantUML</a>
orig	<a href="https://aws.amazon.com/en/architecture/icons/">https://aws.amazon.com/en/architecture/icons/</a>

**Warning:** We are thinking about deprecating this library.

So you should probably use <awslib> instead (see above).



hr

The AWS library consists of Amazon AWS icons, it provides icons of two different sizes (normal and large).

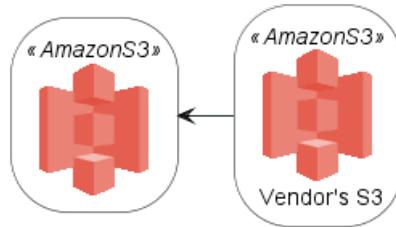
Use it by including the file that contains the sprite, eg: `!include <aws/Storage/AmazonS3/AmazonS3>`. When imported, you can use the sprite as normally you would, using `<$sprite_name>`.

You may also include the `common.puml` file, eg: `!include <aws/common>`, which contains helper macros defined. With the `common.puml` imported, you can use the `NAME_OF_SPRITE(parameters...)` macro.

Example of usage:

```
@startuml  
!include <aws/common>  
!include <aws/Storage/AmazonS3/AmazonS3>
```

```
AMAZONS3(s3_internal)  
AMAZONS3(s3_partner, "Vendor's S3")  
s3_internal <- s3_partner  
@enduml
```



## Contents

<b>1 Sequence Diagram</b>	<b>1</b>
1.1 Basic Examples . . . . .	1
1.2 Declaring participant . . . . .	2
1.3 Declaring participant on multiline . . . . .	4
1.4 Use non-letters in participants . . . . .	4
1.5 Message to Self . . . . .	5
1.6 Text alignment . . . . .	5
1.6.1 Text of response message below the arrow . . . . .	5
1.7 Change arrow style . . . . .	6
1.8 Change arrow color . . . . .	6
1.9 Message sequence numbering . . . . .	7
1.10 Page Title, Header and Footer . . . . .	10
1.11 Splitting diagrams . . . . .	11
1.12 Grouping message . . . . .	11
1.13 Secondary group label . . . . .	12
1.14 Notes on messages . . . . .	13
1.15 Some other notes . . . . .	14
1.16 Changing notes shape [hnote, rnote] . . . . .	15
1.17 Note over all participants [across] . . . . .	15
1.18 Several notes aligned at the same level [/] . . . . .	16
1.19 Creole and HTML . . . . .	17
1.20 Divider or separator . . . . .	18
1.21 Reference . . . . .	18
1.22 Delay . . . . .	19
1.23 Text wrapping . . . . .	19
1.24 Space . . . . .	20
1.25 Lifeline Activation and Destruction . . . . .	20
1.26 Return . . . . .	22
1.27 Participant creation . . . . .	23
1.28 Shortcut syntax for activation, deactivation, creation . . . . .	23
1.29 Incoming and outgoing messages . . . . .	25
1.30 Short arrows for incoming and outgoing messages . . . . .	26
1.31 Anchors and Duration . . . . .	27
1.32 Stereotypes and Spots . . . . .	27
1.33 More information on titles . . . . .	28
1.34 Participants encompass . . . . .	30
1.35 Removing Foot Boxes . . . . .	31
1.36 Skinparam . . . . .	31
1.37 Changing padding . . . . .	33
1.38 Appendix: Examples of all arrow type . . . . .	34
1.38.1 Normal arrow . . . . .	34
1.38.2 Itself arrow . . . . .	35
1.38.3 Incoming and outgoing messages (with '[, ']') . . . . .	36
1.38.4 Incoming messages (with '[') . . . . .	36
1.38.5 Outgoing messages (with ']') . . . . .	38
1.38.6 Short incoming and outgoing messages (with '?') . . . . .	39
1.38.7 Short incoming (with '?') . . . . .	39
1.38.8 Short outgoing (with '?') . . . . .	40
1.39 Specific SkinParameter . . . . .	42
1.39.1 By default . . . . .	42
1.39.2 LifelineStrategy . . . . .	42
1.39.3 style strictuml . . . . .	42
1.40 Hide unlinked participant . . . . .	43
1.41 Color a group message . . . . .	43
1.42 Mainframe . . . . .	44
1.43 Slanted or odd arrows . . . . .	44



<b>2 Use Case Diagram</b>	<b>47</b>
2.1 Usecases . . . . .	47
2.2 Actors . . . . .	47
2.3 Change Actor style . . . . .	48
2.3.1 Stick man ( <i>by default</i> ) . . . . .	48
2.3.2 Awesome man . . . . .	48
2.3.3 Hollow man . . . . .	49
2.4 Usecases description . . . . .	49
2.5 Use package . . . . .	50
2.6 Basic example . . . . .	51
2.7 Extension . . . . .	51
2.8 Using notes . . . . .	52
2.9 Stereotypes . . . . .	52
2.10 Changing arrows direction . . . . .	53
2.11 Splitting diagrams . . . . .	54
2.12 Left to right direction . . . . .	55
2.13 Skinparam . . . . .	55
2.14 Complete example . . . . .	56
2.15 Business Use Case . . . . .	57
2.15.1 Business Usecase . . . . .	57
2.15.2 Business Actor . . . . .	57
2.16 Change arrow color and style (inline style) . . . . .	58
2.17 Change element color and style (inline style) . . . . .	58
2.18 Display JSON Data on Usecase diagram . . . . .	59
2.18.1 Simple example . . . . .	59
<b>3 Class Diagram</b>	<b>60</b>
3.1 Declaring element . . . . .	60
3.2 Relations between classes . . . . .	61
3.3 Label on relations . . . . .	62
3.4 Using non-letters in element names and relation labels . . . . .	62
3.4.1 Starting names with \$ . . . . .	63
3.5 Adding methods . . . . .	63
3.6 Defining visibility . . . . .	64
3.7 Abstract and Static . . . . .	66
3.8 Advanced class body . . . . .	66
3.9 Notes and stereotypes . . . . .	67
3.10 More on notes . . . . .	68
3.11 Note on field (field, attribute, member) or method . . . . .	69
3.11.1 Constraint . . . . .	69
3.11.2 Note on field or method . . . . .	69
3.11.3 Note on method with the same name . . . . .	69
3.12 Note on links . . . . .	70
3.13 Abstract class and interface . . . . .	70
3.14 Hide attributes, methods... . . . . .	71
3.15 Hide classes . . . . .	72
3.16 Remove classes . . . . .	73
3.17 Hide, Remove or Restore tagged element or wildcard . . . . .	73
3.18 Hide or Remove unlinked class . . . . .	75
3.19 Use generics . . . . .	76
3.20 Specific Spot . . . . .	76
3.21 Packages . . . . .	76
3.22 Packages style . . . . .	77
3.23 Namespaces . . . . .	78
3.24 Automatic package creation . . . . .	78
3.25 Lollipop interface . . . . .	79
3.26 Changing arrows orientation . . . . .	79
3.27 Association classes . . . . .	81



3.28 Association on same class . . . . .	82
3.29 Skinparam . . . . .	82
3.30 Skinned Stereotypes . . . . .	83
3.31 Color gradient . . . . .	83
3.32 Help on layout . . . . .	84
3.33 Splitting large files . . . . .	85
3.34 Extends and implements . . . . .	86
3.35 Bracketed relations (linking or arrow) style . . . . .	86
3.35.1 Line style . . . . .	86
3.35.2 Line color . . . . .	87
3.35.3 Line thickness . . . . .	88
3.35.4 Mix . . . . .	89
3.36 Change relation (linking or arrow) color and style (inline style) . . . . .	89
3.37 Change class color and style (inline style) . . . . .	89
3.38 Arrows from/to class members . . . . .	91
3.39 Grouping inheritance arrow heads . . . . .	92
3.39.1 GroupInheritance 1 (no grouping) . . . . .	92
3.39.2 GroupInheritance 2 (grouping from 2) . . . . .	92
3.39.3 GroupInheritance 3 (grouping only from 3) . . . . .	93
3.39.4 GroupInheritance 4 (grouping only from 4) . . . . .	93
3.40 Display JSON Data on Class or Object diagram . . . . .	94
3.40.1 Simple example . . . . .	94
3.41 Packages and Namespaces Enhancement . . . . .	95
<b>4 Object Diagram</b>	<b>97</b>
4.1 Definition of objects . . . . .	97
4.2 Relations between objects . . . . .	97
4.3 Associations objects . . . . .	98
4.4 Adding fields . . . . .	98
4.5 Common features with class diagrams . . . . .	99
4.6 Map table or associative array . . . . .	99
4.7 Program (or project) evaluation and review technique (PERT) with map . . . . .	102
4.8 Display JSON Data on Class or Object diagram . . . . .	103
4.8.1 Simple example . . . . .	103
<b>5 Activity Diagram (legacy)</b>	<b>104</b>
5.1 Simple Action . . . . .	104
5.2 Label on arrows . . . . .	104
5.3 Changing arrow direction . . . . .	104
5.4 Branches . . . . .	105
5.5 More on Branches . . . . .	106
5.6 Synchronization . . . . .	107
5.7 Long action description . . . . .	108
5.8 Notes . . . . .	108
5.9 Partition . . . . .	109
5.10 Skinparam . . . . .	110
5.11 Octagon . . . . .	111
5.12 Complete example . . . . .	111
<b>6 Activity Diagram (New Syntax)</b>	<b>114</b>
6.0.1 Benefits of the New Syntax . . . . .	114
6.0.2 Transition to the New Syntax . . . . .	114
6.1 Simple action . . . . .	114
6.2 Start/Stop/End . . . . .	114
6.3 Conditional . . . . .	115
6.3.1 Several tests (horizontal mode) . . . . .	116
6.3.2 Several tests (vertical mode) . . . . .	117
6.4 Switch and case [switch, case, endswitch] . . . . .	118
6.5 Conditional with stop on an action [kill, detach] . . . . .	119



6.6	Repeat loop . . . . .	120
6.6.1	Simple repeat loop . . . . .	120
6.6.2	Repeat loop with repeat action and backward action . . . . .	120
6.7	Break on a repeat loop [break] . . . . .	121
6.8	Goto and Label Processing [label, goto] . . . . .	122
6.9	While loop . . . . .	123
6.9.1	Simple while loop . . . . .	123
6.9.2	While loop with backward action . . . . .	124
6.9.3	Infinite while loop . . . . .	124
6.10	Parallel processing [fork, fork again, end fork, end merge] . . . . .	125
6.10.1	Simple <code>fork</code> . . . . .	125
6.10.2	<code>fork</code> with end merge . . . . .	125
6.10.3	Label on <code>end fork</code> (or UML joinspec): . . . . .	126
6.10.4	Other example . . . . .	127
6.11	Split processing . . . . .	128
6.11.1	Split . . . . .	128
6.11.2	Input split (multi-start) . . . . .	128
6.11.3	Output split (multi-end) . . . . .	129
6.12	Notes . . . . .	130
6.13	Colors . . . . .	132
6.14	Lines without arrows . . . . .	133
6.15	Arrows . . . . .	133
6.16	Connector . . . . .	134
6.17	Color on connector . . . . .	134
6.18	Grouping or partition . . . . .	135
6.18.1	Group . . . . .	135
6.18.2	Partition . . . . .	136
6.18.3	Group, Partition, Package, Rectangle or Card . . . . .	138
6.19	Swimlanes . . . . .	139
6.20	Detach or kill [detach, kill] . . . . .	142
6.21	SDL (Specification and Description Language) . . . . .	143
6.21.1	Table of SDL Shape Name . . . . .	143
6.21.2	SDL using final separator (Deprecated form) . . . . .	143
6.21.3	SDL using Normal separator and Stereotype (Current offcial form) . . . . .	145
6.22	Complete example . . . . .	146
6.23	Condition Style . . . . .	148
6.23.1	Inside style (by default) . . . . .	148
6.23.2	Diamond style . . . . .	149
6.23.3	InsideDiamond (or <i>Foo1</i> ) style . . . . .	150
6.24	Condition End Style . . . . .	151
6.24.1	Diamond style (by default) . . . . .	151
6.24.2	Horizontal line (hline) style . . . . .	152
6.25	Using (global) style . . . . .	153
6.25.1	Without style ( <i>by default</i> ) . . . . .	153
6.25.2	With style . . . . .	153
<b>7</b>	<b>Component Diagram</b>	<b>156</b>
7.1	Components . . . . .	156
7.1.1	Naming exceptions . . . . .	156
7.2	Interfaces . . . . .	157
7.3	Basic example . . . . .	157
7.4	Using notes . . . . .	157
7.5	Grouping Components . . . . .	159
7.6	Changing arrows direction . . . . .	160
7.7	Use UML2 notation . . . . .	162
7.8	Use UML1 notation . . . . .	162
7.9	Use rectangle notation (remove UML notation) . . . . .	163
7.10	Long description . . . . .	163



7.11 Individual colors . . . . .	163
7.12 Using Sprite in Stereotype . . . . .	163
7.13 Skinparam . . . . .	164
7.14 Specific SkinParameter . . . . .	166
7.14.1 componentStyle . . . . .	166
7.15 Hide or Remove unlinked component . . . . .	167
7.16 Hide, Remove or Restore tagged component or wildcard . . . . .	168
7.17 Display JSON Data on Component diagram . . . . .	170
7.17.1 Simple example . . . . .	170
7.18 Port [port, portIn, portOut] . . . . .	170
7.18.1 Port . . . . .	170
7.18.2 PortIn . . . . .	171
7.18.3 PortOut . . . . .	171
7.18.4 Mixing PortIn & PortOut . . . . .	172
<b>8 Deployment Diagram</b> . . . . .	<b>174</b>
8.1 Declaring element . . . . .	174
8.2 Declaring element (using short form) . . . . .	176
8.2.1 Actor . . . . .	176
8.2.2 Component . . . . .	177
8.2.3 Interface . . . . .	177
8.2.4 Usecase . . . . .	177
8.3 Linking or arrow . . . . .	177
8.4 Bracketed arrow style . . . . .	180
8.4.1 Line style . . . . .	180
8.4.2 Line color . . . . .	181
8.4.3 Line thickness . . . . .	181
8.4.4 Mix . . . . .	182
8.5 Change arrow color and style (inline style) . . . . .	182
8.6 Change element color and style (inline style) . . . . .	183
8.7 Nestable elements . . . . .	184
8.8 Packages and nested elements . . . . .	184
8.8.1 Example with one level . . . . .	184
8.8.2 Other example . . . . .	185
8.8.3 Full nesting . . . . .	186
8.9 Alias . . . . .	190
8.9.1 Simple alias with as . . . . .	190
8.9.2 Examples of long alias . . . . .	191
8.10 Round corner . . . . .	193
8.11 Specific SkinParameter . . . . .	193
8.11.1 roundCorner . . . . .	193
8.12 Appendix: All type of arrow line . . . . .	194
8.13 Appendix: All type of arrow head or '0' arrow . . . . .	195
8.13.1 Type of arrow head . . . . .	195
8.13.2 Type of '0' arrow or circle arrow . . . . .	196
8.14 Appendix: Test of inline style on all element . . . . .	197
8.14.1 Simple element . . . . .	197
8.14.2 Nested element . . . . .	198
8.14.3 Without sub-element . . . . .	198
8.14.4 With sub-element . . . . .	199
8.15 Appendix: Test of style on all element . . . . .	200
8.15.1 Simple element . . . . .	200
8.15.2 Global style (on componentDiagram) . . . . .	200
8.15.3 Style for each element . . . . .	201
8.15.4 Nested element (without level) . . . . .	205
8.15.5 Global style (on componentDiagram) . . . . .	205
8.15.6 Style for each nested element . . . . .	205
8.15.7 Nested element (with one level) . . . . .	207



8.15.8 Global style (on componentDiagram) . . . . .	207
8.15.9 Style for each nested element . . . . .	208
8.16 Appendix: Test of stereotype with style on all element . . . . .	211
8.16.1 Simple element . . . . .	211
8.17 Display JSON Data on Deployment diagram . . . . .	212
8.17.1 Simple example . . . . .	212
8.18 Mixing Deployment (Usecase, Component, Deployment) element within a Class or Object diagram . . . . .	213
8.18.1 Mixing all elements . . . . .	213
8.19 Port [port, portIn, portOut] . . . . .	215
8.19.1 Port . . . . .	215
8.19.2 PortIn . . . . .	216
8.19.3 PortOut . . . . .	216
8.19.4 Mixing PortIn & PortOut . . . . .	217
<b>9 State Diagram</b> . . . . .	<b>219</b>
9.1 Simple State . . . . .	219
9.2 Change state rendering . . . . .	219
9.3 Composite state . . . . .	220
9.3.1 Internal sub-state . . . . .	220
9.3.2 Sub-state to sub-state . . . . .	221
9.4 Long name . . . . .	222
9.5 History [[H], [H*]] . . . . .	223
9.6 Fork [fork, join] . . . . .	223
9.7 Concurrent state [-,   ] . . . . .	224
9.7.1 Horizontal separator -- . . . . .	224
9.7.2 Vertical separator    . . . . .	225
9.8 Conditional [choice] . . . . .	226
9.9 Stereotypes full example [start, choice, fork, join, end] . . . . .	226
9.10 Point [entryPoint, exitPoint] . . . . .	227
9.11 Pin [inputPin, outputPin] . . . . .	228
9.12 Expansion [expansionInput, expansionOutput] . . . . .	229
9.13 Arrow direction . . . . .	230
9.14 Change line color and style . . . . .	231
9.15 Note . . . . .	231
9.16 Note on link . . . . .	232
9.17 More in notes . . . . .	232
9.18 Inline color . . . . .	233
9.19 Skinparam . . . . .	234
9.19.1 Test of all specific skinparam to State Diagrams . . . . .	235
9.20 Changing style . . . . .	235
9.21 Change state color and style (inline style) . . . . .	237
9.22 Alias . . . . .	238
9.23 Display JSON Data on State diagram . . . . .	239
9.23.1 Simple example . . . . .	239
<b>10 Timing Diagram</b> . . . . .	<b>240</b>
10.1 Declaring element or participant . . . . .	240
10.2 Binary and Clock . . . . .	241
10.3 Adding message . . . . .	241
10.4 Relative time . . . . .	242
10.5 Anchor Points . . . . .	243
10.6 Participant oriented . . . . .	243
10.7 Setting scale . . . . .	244
10.8 Initial state . . . . .	245
10.9 Intricated state . . . . .	245
10.9.1 Intricated or undefined robust state . . . . .	245
10.9.2 Intricated or undefined binary state . . . . .	246
10.10 Hidden state . . . . .	246



10.11 Hide time axis . . . . .	248
10.12 Using Time and Date . . . . .	248
10.13 Adding constraint . . . . .	249
10.14 Highlighted period . . . . .	249
10.15 Using notes . . . . .	250
10.16 Adding texts . . . . .	251
10.17 Complete example . . . . .	252
10.18 Digital Example . . . . .	253
10.19 Adding color . . . . .	254
10.20 Using (global) style . . . . .	255
10.20.1 Without style ( <i>by default</i> ) . . . . .	255
10.20.2 With style . . . . .	255
10.21 Applying Colors to specific lines . . . . .	256
10.22 Compact mode . . . . .	257
10.22.1 By default . . . . .	257
10.22.2 Global mode with <code>mode compact</code> . . . . .	258
10.22.3 Local mode with only <code>compact</code> on element . . . . .	258
<b>11 Display JSON Data</b>	<b>260</b>
11.1 Complex example . . . . .	260
11.2 Highlight parts . . . . .	261
11.3 Using different styles for highlight . . . . .	261
11.4 JSON basic element . . . . .	262
11.4.1 Synthesis of all JSON basic element . . . . .	262
11.5 JSON array or table . . . . .	263
11.5.1 Array type . . . . .	263
11.5.2 Minimal array or table . . . . .	264
11.5.3 Number array . . . . .	264
11.5.4 String array . . . . .	264
11.5.5 Boolean array . . . . .	264
11.6 JSON numbers . . . . .	264
11.7 JSON strings . . . . .	265
11.7.1 JSON Unicode . . . . .	265
11.7.2 JSON two-character escape sequence . . . . .	265
11.8 Minimal JSON examples . . . . .	266
11.9 Empty table or list . . . . .	267
11.10 Using (global) style . . . . .	267
11.10.1 Without style ( <i>by default</i> ) . . . . .	267
11.10.2 With style . . . . .	268
11.11 Display JSON Data on Class or Object diagram . . . . .	269
11.11.1 Simple example . . . . .	269
11.11.2 Complex example: with all JSON basic element . . . . .	269
11.12 Display JSON Data on Deployment (Usecase, Component, Deployment) diagram . . . . .	270
11.12.1 Simple example . . . . .	270
11.13 Display JSON Data on State diagram . . . . .	271
11.13.1 Simple example . . . . .	271
<b>12 Display YAML Data</b>	<b>273</b>
12.1 Complex example . . . . .	273
12.2 Specific key (with symbols or unicode) . . . . .	274
12.3 Highlight parts . . . . .	274
12.3.1 Normal style . . . . .	274
12.3.2 Customised style . . . . .	275
12.4 Using different styles for highlight . . . . .	275
12.5 Using (global) style . . . . .	276
12.5.1 Without style ( <i>by default</i> ) . . . . .	276
12.5.2 With style . . . . .	277
<b>13 Network diagram (nwdiag)</b>	<b>279</b>



13.1 Simple diagram . . . . .	279
13.1.1 Define a network . . . . .	279
13.1.2 Define some elements or servers on a network . . . . .	279
13.1.3 Full example . . . . .	279
13.2 Define multiple addresses . . . . .	280
13.3 Grouping nodes . . . . .	281
13.3.1 Define group inside network definitions . . . . .	281
13.3.2 Define group outside of network definitions . . . . .	281
13.3.3 Define several groups on same network . . . . .	282
13.3.4 Example with 2 group . . . . .	282
13.3.5 Example with 3 groups . . . . .	283
13.4 Extended Syntax (for network or group) . . . . .	284
13.4.1 Network . . . . .	284
13.4.2 Group . . . . .	285
13.5 Using Sprites . . . . .	286
13.6 Using OpenIconic . . . . .	287
13.7 Same nodes on more than two networks . . . . .	288
13.8 Peer networks . . . . .	289
13.9 Peer networks and group . . . . .	289
13.9.1 Without group . . . . .	289
13.9.2 Group on first . . . . .	290
13.9.3 Group on second . . . . .	291
13.9.4 Group on third . . . . .	292
13.10 Add title, caption, header, footer or legend on network diagram . . . . .	293
13.11 With or without shadow . . . . .	294
13.11.1 With shadow (by default) . . . . .	294
13.11.2 Without shadow . . . . .	294
13.12 Change width of the networks . . . . .	295
13.13 Other internal networks . . . . .	298
13.14 Using (global) style . . . . .	299
13.14.1 Without style ( <i>by default</i> ) . . . . .	299
13.14.2 With style . . . . .	300
13.15 Appendix: Test of all shapes on Network diagram (nwdiag) . . . . .	301
<b>14 Salt (Wireframe)</b> . . . . .	<b>304</b>
14.1 Basic widgets . . . . .	304
14.2 Text area . . . . .	304
14.3 Open, close dropdown . . . . .	305
14.4 Using grid [  and #, !, -, +] . . . . .	305
14.5 Group box [ ] . . . . .	306
14.6 Using separator [.., ==, ~~, -] . . . . .	306
14.7 Tree widget [T] . . . . .	307
14.8 Tree table [T] . . . . .	307
14.9 Enclosing brackets [{, }] . . . . .	309
14.10 Adding tabs [/] . . . . .	309
14.11 Using menu [*] . . . . .	310
14.12 Advanced table . . . . .	311
14.13 Scroll Bars [S, SI, S-] . . . . .	312
14.14 Colors . . . . .	312
14.15 Creole on Salt . . . . .	313
14.16 Pseudo sprite [«, »] . . . . .	315
14.17 OpenIconic . . . . .	315
14.18 Add title, header, footer, caption or legend . . . . .	316
14.19 Zoom, DPI . . . . .	317
14.19.1 Whitout zoom (by default) . . . . .	317
14.19.2 Scale . . . . .	317
14.19.3 DPI . . . . .	317
14.20 Include Salt "on activity diagram" . . . . .	318



14.21	Include salt "on while condition of activity diagram" . . . . .	320
14.22	Include salt "on repeat while condition of activity diagram" . . . . .	321
14.23	Skipparam . . . . .	322
14.24	Style . . . . .	323
<b>15</b>	<b>Archimate Diagram</b>	<b>324</b>
15.1	Archimate keyword . . . . .	324
15.2	Defining Junctions . . . . .	324
15.3	Example 1 . . . . .	325
15.4	Example 2 . . . . .	326
15.5	List possible sprites . . . . .	327
15.6	ArchiMate Macros . . . . .	327
15.6.1	Archimate Macros and Library . . . . .	327
15.6.2	Archimate elements . . . . .	327
15.6.3	Archimate relationships . . . . .	328
15.6.4	Appendice: Examples of all Archimate RelationTypes . . . . .	329
<b>16</b>	<b>Gantt Diagram</b>	<b>333</b>
16.1	Declaring tasks . . . . .	333
16.1.1	Duration . . . . .	333
16.1.2	Start . . . . .	333
16.1.3	End . . . . .	334
16.1.4	Start/End . . . . .	334
16.2	One-line declaration (with the and conjunction) . . . . .	335
16.3	Adding constraints . . . . .	335
16.4	Short names . . . . .	335
16.5	Customize colors . . . . .	336
16.6	Completion status . . . . .	336
16.6.1	Adding completion depending percentage . . . . .	336
16.6.2	Change colour of completion (by style) . . . . .	336
16.7	Milestone . . . . .	337
16.7.1	Relative milestone (use of constraints) . . . . .	338
16.7.2	Absolute milestone (use of fixed date) . . . . .	338
16.7.3	Milestone of maximum end of tasks . . . . .	338
16.8	Hyperlinks . . . . .	338
16.9	Calendar . . . . .	339
16.10	Coloring days . . . . .	339
16.11	Changing scale . . . . .	339
16.11.1	Daily ( <i>by default</i> ) . . . . .	340
16.11.2	Weekly . . . . .	340
16.11.3	Monthly . . . . .	341
16.11.4	Quarterly . . . . .	341
16.11.5	Yearly . . . . .	342
16.12	Zoom (example for all scale) . . . . .	342
16.12.1	Zoom on weekly scale . . . . .	342
16.12.2	Without zoom . . . . .	342
16.12.3	With zoom . . . . .	342
16.12.4	Zoom on weekly scale . . . . .	343
16.12.5	Without zoom . . . . .	343
16.12.6	With zoom . . . . .	343
16.12.7	Zoom on monthly scale . . . . .	344
16.12.8	Without zoom . . . . .	344
16.12.9	With zoom . . . . .	344
16.12.10	Zoom on quarterly scale . . . . .	344
16.12.11	Without zoom . . . . .	344
16.12.12	With zoom . . . . .	345
16.12.13	Zoom on yearly scale . . . . .	345
16.12.14	Without zoom . . . . .	345
16.12.15	With zoom . . . . .	345



16.13 Weekscale with Weeknumbers or Calendar Date . . . . .	346
16.13.1 With Weeknumbers ( <i>by default</i> ) . . . . .	346
16.13.2 With Calendar Date . . . . .	346
16.14 Close day . . . . .	346
16.15 Definition of a week depending of closed days . . . . .	347
16.16 Working days . . . . .	348
16.17 Simplified task succession . . . . .	348
16.18 Working with resources . . . . .	349
16.19 Hide resources . . . . .	349
16.19.1 Without any hiding (by default) . . . . .	349
16.19.2 Hide resources names . . . . .	350
16.19.3 Hide resources footbox . . . . .	350
16.19.4 Hide the both (resources names and resources footbox) . . . . .	350
16.20 Horizontal Separator . . . . .	351
16.21 Vertical Separator . . . . .	351
16.22 Complex example . . . . .	351
16.23 Comments . . . . .	352
16.24 Using style . . . . .	352
16.24.1 Without style (by default) . . . . .	352
16.24.2 With style . . . . .	353
16.24.3 With style (full example) . . . . .	354
16.24.4 Clean style . . . . .	356
16.25 Add notes . . . . .	357
16.26 Pause tasks . . . . .	359
16.27 Change link colors . . . . .	360
16.28 Tasks or Milestones on the same line . . . . .	361
16.29 Highlight today . . . . .	361
16.30 Task between two milestones . . . . .	361
16.31 Grammar and verbal form . . . . .	362
16.32 Add title, header, footer, caption or legend . . . . .	362
16.33 Removing Foot Boxes (example for all scale) . . . . .	362
16.34 Language of the calendar . . . . .	364
16.34.1 English ( <i>en, by default</i> ) . . . . .	364
16.34.2 Deutsch (de) . . . . .	365
16.34.3 Japanese (ja) . . . . .	365
16.34.4 Chinese (zh) . . . . .	365
16.34.5 Korean (ko) . . . . .	366
16.35 Delete Tasks or Milestones . . . . .	366
16.36 Start a project, a task or a milestone a number of days before or after today . . . . .	367
16.37 Change Label position . . . . .	367
16.37.1 The labels are near elements ( <i>by default</i> ) . . . . .	367
16.37.2 Label on first column . . . . .	368
16.37.3 Label on last column . . . . .	369
<b>17 MindMap</b> . . . . .	<b>371</b>
17.1 OrgMode syntax . . . . .	371
17.2 Markdown syntax . . . . .	371
17.3 Arithmetic notation . . . . .	372
17.4 Multilines . . . . .	372
17.5 Multiroot Mindmap . . . . .	374
17.6 Colors . . . . .	374
17.6.1 With inline color . . . . .	374
17.6.2 With style color . . . . .	375
17.7 Removing box . . . . .	377
17.8 Changing diagram direction . . . . .	378
17.9 Complete example . . . . .	379
17.10 Changing style . . . . .	380
17.10.1 node, depth . . . . .	380



17.10.2 boxless . . . . .	381
17.11 Word Wrap . . . . .	381
17.12 Creole on Mindmap diagram . . . . .	382
<b>18 Work Breakdown Structure (WBS)</b>	<b>385</b>
18.1 OrgMode syntax . . . . .	385
18.2 Change direction . . . . .	385
18.3 Arithmetic notation . . . . .	386
18.4 Multilines . . . . .	386
18.5 Removing box . . . . .	387
18.5.1 Boxless on Arithmetic notation . . . . .	387
18.5.2 Several boxless node . . . . .	387
18.5.3 All boxless node . . . . .	388
18.5.4 Boxless on OrgMode syntax . . . . .	388
18.5.5 Several boxless node . . . . .	388
18.5.6 All boxless node . . . . .	389
18.6 Colors (with inline or style color) . . . . .	389
18.7 Using style . . . . .	391
18.8 Word Wrap . . . . .	392
18.9 Add arrows between WBS elements . . . . .	393
18.10 Creole on WBS diagram . . . . .	394
<b>19 Maths</b>	<b>397</b>
19.1 Standalone diagram . . . . .	398
19.2 How is this working? . . . . .	398
<b>20 Entity Relationship Diagram</b>	<b>399</b>
20.1 Information Engineering Relations . . . . .	399
20.2 Entities . . . . .	399
20.3 Complete Example . . . . .	400
<b>21 Common Commands in PlantUML</b>	<b>402</b>
21.0.1 Global Elements . . . . .	402
21.0.2 Creole Syntax Description . . . . .	402
21.0.3 Style Control Command . . . . .	402
21.1 Comments . . . . .	402
21.1.1 Simple comment . . . . .	402
21.1.2 Block comment . . . . .	402
21.1.3 Full example . . . . .	403
21.2 Zoom . . . . .	403
21.3 Title . . . . .	404
21.4 Caption . . . . .	405
21.5 Footer and header . . . . .	405
21.6 Legend the diagram . . . . .	406
21.7 Appendix: Examples on all diagram . . . . .	406
21.7.1 Activity . . . . .	406
21.7.2 Archimate . . . . .	407
21.7.3 Class . . . . .	408
21.7.4 Component, Deployment, Use-Case . . . . .	408
21.7.5 Gantt project planning . . . . .	409
21.7.6 Object . . . . .	409
21.7.7 MindMap . . . . .	410
21.7.8 Network (nwdiag) . . . . .	411
21.7.9 Sequence . . . . .	411
21.7.10 State . . . . .	412
21.7.11 Timing . . . . .	413
21.7.12 Work Breakdown Structure (WBS) . . . . .	413
21.7.13 Wireframe (SALT) . . . . .	414
21.8 Appendix: Examples on all diagram with style . . . . .	415



21.8.1 Activity . . . . .	415
21.8.2 Archimate . . . . .	417
21.8.3 Class . . . . .	418
21.8.4 Component, Deployment, Use-Case . . . . .	420
21.8.5 Gantt project planning . . . . .	421
21.8.6 Object . . . . .	423
21.8.7 MindMap . . . . .	424
21.8.8 Network (nwdiag) . . . . .	425
21.8.9 Sequence . . . . .	427
21.8.10 State . . . . .	428
21.8.11 Timing . . . . .	430
21.8.12 Work Breakdown Structure (WBS) . . . . .	431
21.8.13 Wireframe (SALT) . . . . .	432
21.9 Mainframe . . . . .	433
21.10 Appendix: Examples of Mainframe on all diagram . . . . .	434
21.10.1 Activity . . . . .	434
21.10.2 Archimate . . . . .	434
21.10.3 Class . . . . .	435
21.10.4 Component, Deployment, Use-Case . . . . .	435
21.10.5 Gantt project planning . . . . .	435
21.10.6 Object . . . . .	436
21.10.7 MindMap . . . . .	436
21.10.8 Network (nwdiag) . . . . .	436
21.10.9 Sequence . . . . .	437
21.10.10 State . . . . .	437
21.10.11 Timing . . . . .	437
21.10.12 Work Breakdown Structure (WBS) . . . . .	438
21.10.13 Wireframe (SALT) . . . . .	438
21.11 Appendix: Examples of title, header, footer, caption, legend and mainframe on all diagram . . . . .	439
21.11.1 Activity . . . . .	439
21.11.2 Archimate . . . . .	439
21.11.3 Class . . . . .	440
21.11.4 Component, Deployment, Use-Case . . . . .	441
21.11.5 Gantt project planning . . . . .	441
21.11.6 Object . . . . .	442
21.11.7 MindMap . . . . .	443
21.11.8 Network (nwdiag) . . . . .	443
21.11.9 Sequence . . . . .	444
21.11.10 State . . . . .	445
21.11.11 Timing . . . . .	445
21.11.12 Work Breakdown Structure (WBS) . . . . .	446
21.11.13 Wireframe (SALT) . . . . .	447
<b>22 Creole</b> . . . . .	<b>449</b>
22.1 Emphasized text . . . . .	449
22.2 Lists . . . . .	449
22.3 Escape character . . . . .	450
22.4 Headings . . . . .	450
22.5 Emoji . . . . .	451
22.5.1 Unicode block 26 . . . . .	451
22.6 Horizontal lines . . . . .	452
22.7 Links . . . . .	453
22.8 Code . . . . .	453
22.9 Table . . . . .	454
22.9.1 Create a table . . . . .	454
22.9.2 Add color on rows or cells . . . . .	455
22.9.3 Add color on border and text . . . . .	455
22.9.4 No border or same color as the background . . . . .	455



22.9.5 Bold header or not . . . . .	455
22.10Tree . . . . .	456
22.11Special characters . . . . .	458
22.12Legacy HTML . . . . .	459
22.12.1 Common HTML element . . . . .	460
22.12.2 Subscript and Superscript element [sub, sup] . . . . .	461
22.13OpenIconic . . . . .	461
22.14Appendix: Examples of "Creole List" on all diagrams . . . . .	462
22.14.1 Activity . . . . .	462
22.14.2 Class . . . . .	463
22.14.3 Component, Deployment, Use-Case . . . . .	464
22.14.4 Gantt project planning . . . . .	465
22.14.5 Object . . . . .	465
22.14.6 MindMap . . . . .	466
22.14.7 Network (nwdiag) . . . . .	466
22.14.8 Note . . . . .	467
22.14.9 Sequence . . . . .	467
22.14.10State . . . . .	468
22.14.11WBS . . . . .	469
22.15Appendix: Examples of "Creole horizontal lines" on all diagrams . . . . .	470
22.15.1 Activity . . . . .	470
22.15.2 Class . . . . .	471
22.15.3 Component, Deployment, Use-Case . . . . .	471
22.15.4 Gantt project planning . . . . .	473
22.15.5 Object . . . . .	473
22.15.6 MindMap . . . . .	474
22.15.7 Network (nwdiag) . . . . .	474
22.15.8 Note . . . . .	475
22.15.9 Sequence . . . . .	475
22.15.10State . . . . .	476
22.15.11WBS . . . . .	477
22.16Style equivalent (between Creole and HTML) . . . . .	478
<b>23 Defining and using sprites</b>	<b>480</b>
23.1 Inline SVG sprite . . . . .	481
23.2 Changing colors . . . . .	481
23.3 Encoding Sprite . . . . .	482
23.4 Importing Sprite . . . . .	482
23.5 Examples . . . . .	482
23.6 StdLib . . . . .	483
23.7 Listing Sprites . . . . .	483
<b>24 Skinparam command</b>	<b>485</b>
24.1 Usage . . . . .	485
24.2 Nested . . . . .	485
24.3 Black and White . . . . .	485
24.4 Shadowing . . . . .	486
24.5 Reverse colors . . . . .	486
24.6 Colors . . . . .	487
24.7 Font color, name and size . . . . .	488
24.8 Text Alignment . . . . .	488
24.9 Examples . . . . .	489
24.10List of all skinparam parameters . . . . .	493
24.10.1 Command Line: -language command . . . . .	493
24.10.2 Command: help skinparams . . . . .	493
24.10.3 Command: skinparameters . . . . .	493
24.10.4 All Skin Parameters on the Ashley's PlantUML Doc . . . . .	495
<b>25 Preprocessing</b>	<b>496</b>



25.1 Variable definition [=, ?=] . . . . .	496
25.2 Boolean expression . . . . .	497
25.2.1 Boolean representation [0 is false] . . . . .	497
25.2.2 Boolean operation and operator [&&,   , ()] . . . . .	497
25.2.3 Boolean builtin functions [%false(), %true(), %not(<exp>)] . . . . .	497
25.3 Conditions [!if, !else, !elseif, !endif] . . . . .	497
25.4 While loop [!while, !endwhile] . . . . .	498
25.4.1 While loop (on Activity diagram) . . . . .	498
25.4.2 While loop (on Mindmap diagram) . . . . .	499
25.4.3 While loop (on Component/Deployment diagram) . . . . .	500
25.5 Procedure [!procedure, !endprocedure] . . . . .	500
25.6 Return function [!function, !endfunction] . . . . .	501
25.7 Default argument value . . . . .	502
25.8 Unquoted procedure or function [!unquoted] . . . . .	503
25.9 Keywords arguments . . . . .	504
25.10 Including files or URL [!include, !include_many, !include_once] . . . . .	504
25.11 Including Subpart [!startsub, !endsub, !includesub] . . . . .	505
25.12 Builtin functions [%] . . . . .	505
25.13 Logging [!log] . . . . .	506
25.14 Memory dump [!dump_memory] . . . . .	507
25.15 Assertion [!assert] . . . . .	507
25.16 Building custom library [!import, !include] . . . . .	508
25.17 Search path . . . . .	508
25.18 Argument concatenation [##] . . . . .	508
25.19 Dynamic invocation [%invoke_procedure(), %call_user_func()] . . . . .	509
25.20 Evaluation of addition depending of data types [+] . . . . .	510
25.21 Preprocessing JSON . . . . .	510
25.22 Including theme [!theme] . . . . .	510
25.23 Migration notes . . . . .	511
25.24 %Splitstr builtin function . . . . .	511
<b>26 Unicode</b> . . . . .	<b>512</b>
26.1 Examples . . . . .	512
26.2 Charset . . . . .	514
26.3 Using Unicode Character on PlantUML . . . . .	514
<b>27 PlantUML Standard Library</b> . . . . .	<b>515</b>
27.0.1 Standard Library Overview . . . . .	515
27.0.2 Contribution from the Community . . . . .	515
27.1 List of Standard Library . . . . .	515
27.2 ArchiMate [archimate] . . . . .	517
27.2.1 List possible sprites . . . . .	518
27.3 Amazon Labs AWS Library [awslib] . . . . .	519
27.4 Azure library [azure] . . . . .	520
27.5 C4 Library [C4] . . . . .	521
27.6 Cloud Insight [cloudinsight] . . . . .	521
27.7 Cloudogu [cloudogu] . . . . .	522
27.8 Elastic library [elastic] . . . . .	523
27.9 Google Material Icons [material] . . . . .	525
27.10 Kubernetes [kubernetes] . . . . .	526
27.11 Logos [logos] . . . . .	527
27.12 Office [office] . . . . .	529
27.13 Open Security Architecture (OSA) [osa] . . . . .	531
27.14 Tupadr3 library [tupadr3] . . . . .	534
27.15 AWS library [aws] . . . . .	535

