MeVisLab Definition Language (MDL) Reference

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Abstract

This document describes the MDL (**M**eVisLab **D**efinition **L**anguage) of MeVisLab and was published on 2023-09-25.

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Chapter 1. MDL Syntax

This is a short introduction to the **M**eVisLab **D**efinition **L**anguage (MDL), in which all `*.def`, `*.script` and various other files for the MeVisLab are written. The MDL is a configuration and layouting language, not a real programming language. You can set tags and values for the tags, but there are some extensions to this static scheme.

If found in `*.def` or `*.script` files, the MDL is used for layouting the GUI of modules. That is the arranging of fields implemented in C++ on a module panel or adding new fields and functionality to modules, especially to macro modules.

Besides just layouting the GUI for a module, the MDL offers adding commands that call scripting methods (Python) on occasions like altering a field's value or opening a module's panel. The MDL controls can be scripted with Python, a scripting link into the MeVisLab Scripting Reference is given where appropriate.

MDL is tag-based. Typically, a tag is set to a certain value or to a group of tags. There are also special tags to conditionally parse parts of a file or to test for miscellaneous conditions.

1.1. Tags and Values

Setting a tag is simple:

```
TAGNAME = VALUE
```

The equal-sign ("=") has to be used between every tag and its value, except for groups, where it is optional (see "Groups"). TAGNAME as well as VALUE need to be a single token. If a token should contain whitespace, there are various ways to quote this value.

The most simple method is to enclose a value containing whitespace in quotes:

```
myTag = "Example with whitespace and \"quotes\" and a \\ backslash "
```

As you can see, quotes and backslashes are escaped with backslashes, which can be annoying when you need to use many of them. There are two alternative ways to enclose long values that contain special characters:

```
// enclosing with "* *"
droppedFileCommand = "*py: ctx.field("fileName").value = args[0] *"

// enclosing with @@
droppedFileCommand = @@py: ctx.field("fileName").value = args[0] @@
```

Inside strings starting with a quote-star and ending with a star-quote or inside of strings enclosed in double-@ (at) you can use all characters without escaping them except for the backslash char. Only if you want to use a sequence of characters that is the same as the ending of the used delimiters, you need to escape them with backslashes.

If you use any kind of quoting, you need to escape backslashes with a double backslash (\\).

Overview of quoting and the characters you need to escape with a backslash:

`" ... "`
: escape " with \" or use ' in Python instead

  escape \ with \\

`"* ... *"`
: escape *" with *\"

escape \ with \\

`@@ ... @@`
: escape @@ with @\@

  escape \ with \\

1.2. Tag Data Types

The different tags in the MDL have different data types. Those data types are listed here with a general explanation. A more detailed explanation can be found at the actual tags.

`STRING`
: An arbitrary description string. If the string contains spaces, it has to be enclosed in quotes.

  The tag data of type `STRING` may be translated to other languages by an internationalization mechanism.

  This type is used as a control's `name`, as its `title`, `comment`, `whatsThis`- and `toolTip` text.

  Examples:

```
title   = SomeExampleTitle
comment = "This example comment contains spaces"
```

`STRINGLIST`
: A list of strings, separated by commas or spaces.

  This type is used for the `genre` and `group` and various other tags.

  Examples:

```
genre = Lung
group = "Release, LungPrivate"
```

`AUTHORS`
: A list of comma separated strings. The authors have to be written as "FirstName LastName".

`NAME`
: A unique identifier which must not contain spaces.

  This type is used for identifying objects across script, scripting and C++ code. Tags such as `item`, `module`, `DLL`, `field panel` or `deprecatedName` are of this type.

`NAMELIST`
: A list of unique identifiers, separated by commas. The unique identifiers must not contain spaces.

  This type is used for the `filter` tag of the EventFilter.

  To get a list of the possible values of the `filter` tag, use the auto-completion of the texteditor MATE.

`BOOL`
: A Boolean value.

  Possible values are `Yes`, `No`, `True`, `False`, `On` and `Off`.

`UINT`
: An unsigned integer value.

`INT`
: An integer value.

`FLOAT`
A floating point value.

`ENUM`
One of a fixed list of unique identifiers.

Have a look at the detailed description of tags of type `ENUM` for the possible values and the default value. Also, the possible values are shown in MATE's auto-completion.

`FIELD`
A unique and existing identifier of a field.

This type is used, i.e., for the `field` tag of the Accel.

`FIELDLIST`
A list of unique and existing field identifiers, separated by commas.

This type is used for the list of fields in the Persistence description.

`FIELDEXPRESSION`
An expression that is based on field values.

This type is used for the tags `min`, `max`, `dependsOn`, and `visibleOn`.

The following operators are supported (precedence in order of appearance):

- `( )`

  parentheses

- `||`

  logical or expression (lazy-evaluated)

- `&&`

  logical and expression (lazy-evaluated)

- `== != < <= > >=`

  comparison, Boolean fields and expressions are compared as Boolean, numbers are compared as numbers and everything else is compared as strings. If the right hand side is a regexp, the left hand expression is matched to the regexp.

- `+ -`

  addition and subtraction; numbers are handled as expected, if one of the arguments is not a number the values are concatenated as strings resp. the second argument is removed as string from the first argument string if found.

- `*`

  multiplication, only applicable on number arguments

- `-`

  unary minus that can be used in front of parentheses and numbers or number fields

- `!`

  unary not that can be used in front of parentheses and Boolean fields

- [sequence of digits (with optional . somewhere but not in the first place)] numerical value

- `fieldName`

  the name of a field (may also be a qualified name with modulename.fieldname)

  Bool Fields are interpreted as their bool value, all other fields are interpreted as their string or number value, depending on the operation applied.

- `"String"`

  a string constant that is given in quotes. Note that there is no way of quoting " inside of a string at the moment.

- `/regexp/[i]`

  a regular expression, the optional i after the closing / makes the expression case insensitive

  Regular expression can only be used on the right hand side of a comparison.

  Note that there is no way of quoting / inside of a string at the moment.

Some operations are provided as functions, i.e., like

```
functionName(argument0, ...)
```

- `min()`: returns minimum value of all arguments
- `max()`: returns maximum value of all arguments
- `abs()`: returns absolute(positive) value of argument
- `if()`: returns second argument if first argument evaluates to `true`, otherwise the third argument is returned

`PATH`
: A relative or absolute path to a directory. If it is a relative path, useful variables are listed in Section 1.4, “Variables”.

  The path delimiter is a "/", independent of the platform.

`FILE`
: Same as `PATH` but with a specified file. This file can be, i.e., a scripting file (`.py`), an HTML file (`.html`) or a network file (`.mlab`).

`SCRIPT`
: A unique name of a scripting function implemented in a separated and included scripting file or a single line of scripting.

`COLOR`
: A color definition, explained in more detail here.

`KEYSEQUENCE`
: A keysequence or shortcut to trigger certain functionality. The set string may be translated to other languages by an internationalization mechanism.

  A `KEYSEQUENCE` is used in menus and in the Accel.

`RICHTEXT`
: A string containing HTML formatting.

  This type is used in the TextView or similar controls.

A table with all supported HTML tags can be found in the chapter RichText.

`FORMATSTRING`
: A C-like expression for formatting a (floating point) number.

  Have a look at the NumberEdit control for more information.

`REGEXP`
: A regular expression for string matching.

  This type is used in the LineEdit control for validating the entered string.

`QTSLOT`
: A Qt-slot which is triggered if a control emits a signal.

  This type is used in the MenuItem.

1.3. Groups

Group tags are used for hierarchical tags. This means that you can build not only flat tag lists but also complete tree hierarchies. A group tag starts with a tag name, an optional value and an opening curly-brace, it ends with a closing curly-brace. Inside of the braces you can set normal tags with values or other group tags:

```
myGroup exampleGroup {
    normalTag = "This is a normal tag"
    groupInside {
        insideTag = "Another example tag"
    }
}
tagOnlyGroup {
    normalTag = "This group has no value"
}
```

Contrary to normal tags, a group tag does not need to have a value. The second example above shows a group that has only the tag name but no value, before the group is opened.

1.4. Variables

MDL has some predefined variables that are useful for its purposes. To get the value of a variable, write its name inside a pair of parentheses with a dollar sign prefix: `$(VARNAME)`.

The following variables are defined:

LOCAL - Contains the full path of the currently parsed file.
HOME - Home directory of the user.
PackageIdentifier - Unique name, the structure is: "MLAB_PackageGroup_PackageName"

In addition to these predefined variables, you can get the values of all tags from the mevislab.prefs file.

Variables in MDL can be escaped by writing $(*VARNAME*), which expands to $(VARNAME).

1.5. Including Files

MDL allows you to include files with the #include statement. This is equivalent to pasting the given file at the position of the include statement:

```
#include $(LOCAL)/anotherfile.script
```

The same file can be included multiple times at different places in an MDL file. It is recommended to name included files either *.script or *.inc. You should not use the *.def extension, because this is reserved for module definition files and would be read automatically by MeVisLab on startup.

1.6. Conditions and Special Statements

MDL allows to parse or skip parts of files depending on conditions. Additionally there are some statements that allow simple debugging and printing of messages.

`#ifset` and `#ifnset` are used to test if a variable is set to one of the following values: true, on, yes, 1 . If the variable is not set or has a different value, the block is not parsed.

The variables can be defined in the mevislab.prefs file.

```
#ifset ApplicationAdvanced {
   // if $(ApplicationAdvanced) is defined and set to true, on, yes or 1, parse inside this block
   Field advancedField {}
}
#ifnset ApplicationAdvanced {
   // if $(ApplicationAdvanced) is undefined or not set to true, parse the following block
   Field normalField {}
}
```

`#ifdef` and `#ifndef` are used to test for existence of variables (and not its value)

```
#ifdef CPU {
    // if $(CPU) is defined, parse inside this block
    cpuTag = "$(CPU)"
}
#ifndef CPU {
    // if $(CPU) is undefined, parse the following block
    cpuTag = "CPU unknown"
}
```

The `#if` statement is another conditional for parsing blocks. With `#if` you can test the boolean value of a variable or compare two variables as strings or numbers or compare a variable with a static string. The following operations are possible for compare: <, >, ==, >=, <=, !=

```
#if $(DEBUG) {
    // Parse this if DEBUG is a variable and has the boolean value true
    debugTag = "Debugging is fun"
}
#if "$(VERSION) >= $(MINVERSION)" {
    // If the variables can be parsed as floating point numbers, make numeric comparison
    // otherwise a lexical comparison is done
    featureForVersion = true
}
#if "$(HOME) == $(LOCAL)" {
    // Parse this if the current MDL file resides in the user's home directory
    myHome = "is my castle"
}
```

The #echo statement allows you to print out the value of variables or any other string to the console, which can be very useful for debugging:

```
#if $(DEBUG) {
    #echo "HOME-Dir is $(HOME)"
}
```

The #abort statement is used to print an error message and to stop the parser:

```
#ifndef DefaultFont {
    #abort "No default font available!"
}
```

1.7. Comments

Comments in MDL are the same as in C++:

```
// This is a comment before a tag
myTag = myValue
/*
 The following tags are not parsed, because they are inside a comment block
 tag01 = unparsed
 tag02 = unparsed
*/
anotherTag = anotherValue  // Comment after Tag/Value Pair
```

Comments can be placed anywhere in the MDL file, but not between a tag and its value.

1.8. Naming Conventions and Limitations

Although it is not needed by the parser, it is recommended to use tag names without whitespace and to separate words in tag names with uppercase characters. Both of the following examples are allowed, but the latter is recommended:

```
"Tag with four words" = "The Value"
tagWithFourWords = "The Value"
```

You can use any character sequence for tag names as long as they are parsable as one tag. To start tag names with characters that end or start new syntactic constructs, for example "{" or "=", you have to enclose them in quotes or use the same methods as for values.

1.9. Validation

MeVisLab contains a complete definition of allowed MDL tags and throws warnings if the validation of an MDL script fails. Usually it adds a link to the online documentation so that you can see what tags are possible in the scope you are in.

Chapter 2. Module (Abstract) Declaration

MeVisLab supports three different types of modules, which are derived from an abstract module:

- MLModule (an image processing module using the ML)
- InventorModule (a visualization module derived from OpenInventor)
- MacroModule (a macro module that encapsulates a internal network and has its own panel/script)

The following module tags are supported by all module types. Details on the different modules are given in the following sections.

Dynamic scripting: MLABModule

```
[MLModule|InventorModule|MacroModule] NAME {

  genre              = STRINGLIST
  author             = AUTHORS
  status             = STRING
  group              = STRINGLIST
  comment            = STRING
  keywords           = STRING
  exampleNetwork     = FILE
  seeAlso            = STRING
  documentation      = FILE

  hasTranslation       = BOOL           [No]
  translationModules   = STRINGLIST
  translationLanguages = STRINGLIST

  deprecatedName     = STRING
  externalDefinition = FILE
  associatedTests    = STRINGLIST
  relatedFile        = FILE

  activeInputIndex   = FIELDEXPRESSION
  activeOutputIndex  = FIELDEXPRESSION

  exportedWindow     = STRING

  Interface {
    Inputs {
      Field NAME {...}
      ...
    }

    Outputs {
      Field NAME {...}
      ...
    }

    Parameters {
      Field NAME {...}
      ...
    }
  }

  Description {
    Field NAME {...}
    ...
  }

  Commands {

    source = FILE

    // more source tags...

    importPath = PATH

    // more importPath tags...
    initCommand         = SCRIPT
    wakeupCommand       = SCRIPT
    droppedFileCommand  = SCRIPT
    droppedFilesCommand = SCRIPT

    FieldListener [FIELD] { ... }
  }

  Deployment {

    directory = PATH
    ...
    file      = FILE
    ...
    module    = NAME
    ...
    DLL       = NAME
    ...
  }

  Persistence {

    fields = FIELDLIST

    Module NAME {
      fields = FIELDLIST
    }
  }

  NetworkPanel {

    info = EXPRESSION

    Button [FIELD} { ... }
  }


  Window [NAME] {
    ...
  }

  // more windows...

}
```

genre = GENRENAMES

specifies one or more genre this module is in. Genres are separated by "," and have to be declared in the global genre file of MeVisLab. If a given genre is not defined, you will get a validator warning and the module is put into the "Other" genre. The genre tag is used to generate automatic entries in the Modules menu of MeVisLab and in the documentation. A module can be in multiple genres.

Example: `genre = "Image, Diffusion"`

see also: Section 3.1, “Module Genre Definition”

author = AUTHORS

sets the author(s) of the module, starting with the primary author. Authors have to be separated by "," and should contain first and last name.

Example: `author = "Author1, Author2"`

However, if you list a single author, do not use the format "Last, First" as this results in a pair of authors with just one last name each. Just state the author's name with "First Last".

Warning

Do not write anything except the authors' names in this tag, because the names are used for automatic documentation generation.

status = STRING

sets the status of the module.

Currently used words are:

- `Stable`
- `Work-in-progress`
- `Test`
- `Deprecated`

`group` `= STRINGLIST`

sets a list of group names separated by ",". If no group is set, the module is always visible in MeVisLab. If a list of groups is set, the module is only visible in MeVisLab if one of the groups is enabled in the MeVisLab prefs file (mevislab.prefs) via the "EnabledGroups" tag.

Note

Visible means that the user can find the module in the search dialogs and in the Modules menu. The modules can still be loaded from a saved network or inside an application, even if they are not visible.

Special groups:

- Release : if the string contains the keyword "release", the module is visible in the MeVisLab release version (otherwise it is not visible in the release, regardless of the other groups!)

- Deprecated : if the string contains the keyword "deprecated", you have to enable the "deprecated" tag to see the modules, regardless of the other groups

Examples:

```
group = Deprecated // module will only be visible if "EnabledGroups" contains "deprecated"

group = Release // module will be visible in MeVisLab release

group = LungPrivate // module will only be visible if "EnabledGroups" contains "LungPrivate" and if MeVisLab is not in release mode

group = Release, LungPrivate // module will only be visible if "EnabledGroups" contains "LungPrivate"
```

`comment` `= STRING`

sets a short comment which is shown in the MeVisLab help system and on the network.

(We recommend that you only write a short comment here and use the module documentation for further information.)

`documentation` `= FILE`

This tag is deprecated since MeVisLab 2.2.

It was used for referencing a HTML module help page that was not found at the default location

```
$(LOCAL)/html/ModuleName.html
```

The module help is now written with MATE and automatically generated by MeVisLab.

For more information: Section 26.9, “Module Help Editor”

`keywords` `= STRING`

sets keywords that are used in the MeVisLab search to find a module by its keywords. The keywords are separated by " ".

Make sure that you only use adequate keywords, otherwise your module will be found more often than wanted. Having no keywords decreases the possibility that someone finds the module.

You do not need to set any part of a module's name as keyword, it does not help the least. For example, refrain from setting "examiner viewer" as keywords for the module SoExaminerViewer.

`exampleNetwork` `= FILE`

sets an example MeVisLab network that the user can open to see how the module could be used in connection with other module.

This tag can be used multiple times for a module to link to a number of example networks.

`seeAlso` `= STRING`

sets a reference to other modules that are related to this module, separated by " ".

Example: `seeAlso = "SoView2D SoOrthoView2D"`

`externalDefinition` `= FILE`

defines a module's interface, GUI windows, and field properties in an external file, typically with the file extension ".script". It is advised to use the naming convention $(LOCAL)/ModuleName.script if you use this tag. The advantage of using this feature is that the MDL file needs only be parsed when the module is really created and not when MeVisLab is started. Make sure that you still provide the simple tags (`author`, `comment`, etc.) in the *.def file so that they are available when MeVisLab is started.

Example: `externalDefinition = $(LOCAL)/ModuleName.script`

Tip

This is typically used in MacroModules, especially when they are applications, to avoid that MeVisLab reads the whole application definition on startup.

`associatedTests` `= STRINGLIST`

specifies a list of functional tests that are associated to the module.

Use the macro module TestCaseManager to generate new tests or to browse and modify existing tests.

See the document TestCenter Manual for more information about functional test cases for specific modules.

`hasTranslation` `= BOOL`

defines if this module has translations. If a module has translations, then all MDL strings of that module and all occurrences of ctx.translate() in its Python source files will be collected and written to a *.ts file. See Translations for more information.

`translationModules` `= STRINGLIST`

defines a comma separated list of modules that also have translations. See Translations for more information.

`translationLanguages` `= STRINGLIST`

defines a comma separated list of language initials. For example, "en,de,it". See Translations for more information.

`deprecatedName` `= STRING`

defines an old (deprecated) name for this module, so that networks that contain a module with this name can still be loaded even if the module name was changed.

`relatedFile` `= FILE`
references a file that belongs to this module and should appear in the list of related files in the module context menu (besides the automatic entries). It is advised to reference files relative to $(LOCAL). The tag can be used multiple times.

Example: `relatedFile = $(LOCAL)/../SomeSharedConfigFile.xml`

`activeInputIndex` `= FIELDEXPRESSION`
the given field expression is evaluated and the calculated integer index is used to highlight the active input connector (e.g., for modules like Switch). Negative values mean that no connector will be active, with the exception of -3, which means that all connectors are active.

`activeOutputIndex` `= FIELDEXPRESSION`
the given field expression is evaluated and the calculated integer index is used to highlight the active output connector (e.g., for modules like BaseSwitch). Negative values mean that no connector will be active, with the exception of -3, which means that all connectors are active.

`exportedWindow` `= STRING`

Note

Only evaluated by the MeVisLab Web Toolkit, which is not part of the public SDK.

gives the names of GUI panels that should be available remotely. This may also be the name of a panel of a sub-module by giving the name as *submodulename.panelname*. This tag may be used multiple times. If the given panels reference fields of sub-modules, these fields are exported automatically as fields of the remote module under the name *submodulename.fieldname*.

2.1. Interface

The interface section is used to declare any extra fields of a module. While it is possible to use the interface section in a ML/InventorModule, it is typically only used for MacroModule, since the ML and Inventor modules get their fields automatically from C++. If you want to add a description for a C++ field, refer to the Description section.

The interface section can contain three subgroups: Inputs, Outputs and Parameters. Inputs and Outputs are typically Image, SoNode or MLBase fields, while the Parameters section typically holds parameter fields like floats, vectors, or color. The declared fields can be both standalone script fields or they can alias an internal field of the internal network of a MacroModule.

```
// script field:
Field NAME {
  type         = ENUM
  value        = STRING
  comment      = STRING
  hidden       = BOOL             [No]
  priority     = INT              [100]
  editable     = BOOL             [Yes]
  persistent   = BOOL             [Yes]
  isFilePath   = BOOL             [No]
  min          = FIELDEXPRESSION
  max          = FIELDEXPRESSION
  internalName = FIELD
  allowedTypes = STRING
  legacyValue  = STRING
  visibleOn    = FIELDEXPRESSION
  dependsOn    = FIELDEXPRESSION

  // for enums:
  items {
    item NAME {
      title          = STRING
      deprecatedName = STRING
      // more deprecatedName tags
    }
    ...
  }
  // old deprecated enum syntax:
  values = STRING
}
```

`type` `= ENUM`
defines the type of the field (is automatically given if `internalName` is used).

Possible values:

- Bool
- Color
- Double
- Enum
- Float
- Image
- Integer
- Matrix
- MLBase
- Plane
- Rotation
- SoNode
- String
- Trigger
- Vector2, Vector3, Vector4

`value` `= STRING`
sets a default value for the field (will only be assigned when a module is newly created, NOT on reload of a module), will be overwritten by a stored value when loaded from a network.

Table 2.1. Value formats by field type

Type	Value Format	Example
Bool	`true`, `yes`, `1`, and `on` evaluate to true (case insensitive), all other strings to false	Yes
Color	three floating point values in the range 0.0 to 1.0	"1.0 0.5 0.0"
Double	a single floating point value	0.33
Enum	the name of an enum item	item2
Float	a single floating point value	0.33
Image	n/a: images are programatically specified	n/a
Integer	a single integer value	7
Matrix	16 floating point values, if less are given, then missing elements are taken from the identity	"1.0 0.0 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 1.0"
MLBase	n/a: base objects are programatically specified	n/a
Plane	4 floating point values	"12.0 14.0 5.23 33.0"
Rotation	4 floating point values	"9.0 2.22 7.33 55.2"
SoNode	n/a: nodes are programatically specified	n/a
String	a string, which must be quoted if it contains spaces	"a string with spaces"
Trigger	n/a: a trigger has no value, but triggers an action	n/a
Vector2, Vector3, Vector4	2, 3 or 4 floating point values	"234.33 221.0 223.0 11.23"

`legacyValue` `= STRING`
sets a default value for the field when a module is loaded from a network and no value was specified for the field in the saved network. This allows to give a new default value with the value tag and to keep old networks working by setting a compatible legacyValue for old networks.

`comment` `= STRING`
sets a comment describing the field (which is shown at the input/output tool tip).

`hidden` `= BOOL (default: No)`
sets whether the field should be visible in the MeVisLab network (this can be used to hide existing input/output images).

`priority` `= INT (default: 100)`
sets the notification priority of the field. A value of 0 means that the field has high priority and GUI controls depending on this field will be updated immediately when the field changes.

`editable` `= BOOL (default: Yes)`
sets whether the field should be editable by default. Also sets the `persistent` attribute to the same value (if not specified explicitly).

`persistent` `= BOOL (default: Yes)`
sets whether the field value should be stored in networks (save to disk and copy+paste).

isFilePath = `BOOL (default: No)`

Only applicable for fields of type String. Marks the field as containing a file path. When saving to a network file the value of this field will be attempted to be expressed with a defined set of path variables like $(NETWORK), to make the network relocatable. Also provides Field controls with an automatic browse button.

min = `FIELDEXPRESSION`

sets a minimum value for the field, only works on Number fields. The value can be given as a float value or as an expression containing other fields which provides and updates the minimum value if these fields change.

max = `FIELDEXPRESSION`

sets a maximum value for the field. It only works on Number fields. The value can be given as a float value or as an expression containing other fields which provides and updates the minimum value if these fields change.

visibleOn = `FIELDEXPRESSION`

sets an expression that is used to decide if the field should be visible on the GUI. In case of an input/output field, the field's connector on the network is shown/hidden depending on the expression. In case of a parameter field, the expression is used as visibleOn default for all MDL GUI controls that display this field. A visibleOn tag in a GUI control overrides the field's default for that GUI control.

dependsOn = `FIELDEXPRESSION`

sets an expression that is used to decide if the field should be enabled/disabled on the GUI. In case of an input/output field, the field's connector on the network is rendered in an active/non-active state depending on the expression. In case of a parameter field, the expression is used as dependsOn default for all MDL GUI controls that display this field. A dependsOn tag in a GUI control overrides the field's default for that GUI control.

internalName = `FIELD`

defines that the field should alias an internal field of the internal network of a macro module.

If the internal name is given, the `type` of the generated field cannot be selected and is given by the internal field.

allowedTypes = `STRING`

gives the names (separated by whitespace) of Base types this field accepts or provides. Only valid for fields of `type` MLBase.

This is used by MeVisLab as a hint which MLBase fields can be connected. Specifying this should not be necessary if `internalName` was given for a field, as the type information of that field will be used in this case. Note that this is only a hint, you will still be able to set any Base object by scripting.

As long as the specified type(s) is/are not loaded by the run-time type system of MeVisLab, the type(s) can not be resolved and MLBase fields of any type are allowed to be connected to this field. Base types are automatically loaded if other modules that use this type are loaded in MeVisLab.

deprecatedName = `NAME`

sets an old name to the field which allows to rename fields in MacroModules/C++ and keep old networks and scripts working. If any `deprecatedName` appears anywhere in a GUI description, a stored network or in scripting, it is automatically mapped to the name of this field.

(Any number of `deprecatedName` tags can be set. They are all parsed.)

items

specifies the enumeration items if the field is of type Enum.

item = `NAME`

specifies the (token) name of the item.

title = STRING

specifies the user visible name of the item.

deprecatedName = STRING

specifies an old deprecated name for the item which can be used on setStringValue and which causes the enum to take the value of item instead of the old value.

This tag is used to allow old networks and scripts to work even if enum items have changed or have gone away completely.

`values` `= STRING`
defines the enum values in a comma-separated list

This tag is deprecated and should no longer be used, use `items` instead.

2.2. Description

The Description section can be used in addition to the Interface section to assign extra properties to existing C++ fields. No new fields can be created in the Description section, only properties can be added to already existing fields.

```
Description {
  Field NAME {
    value          = STRING
    legacyValue    = STRING
    comment        = STRING
    hidden         = BOOL              [No]
    priority       = INT               [100]
    editable       = BOOL              [Yes]
    persistent     = BOOL              [Yes]
    isFilePath     = BOOL              [No]
    min            = FIELDEXPRESSION
    max            = FIELDEXPRESSION
    visibleOn      = FIELDEXPRESSION
    dependsOn      = FIELDEXPRESSION
    deprecatedName = NAME
    removed        = BOOL              [No]

    // for enums:
    items {
      item NAME {
        title = STRING
      }
      deprecatedName = STRING

      // more deprecatedName tags
      ...
    }
   ...
  }
}
```

`value` `= STRING`
sets a default value for the field (will only be assigned when module is newly created, NOT on reloading a module), will be overwritten by a stored value when loaded from a network.

Note

If you specify a value in both the Interface section and the Description section, the value from the Description section will win.

`legacyValue` `= STRING`
sets a default value for the field when a module is loaded from a network and no value was specified for the field in the saved network. This allows to give a new default value with the value tag and to keep old networks from working by setting a compatible legacyValue for old networks.

`comment` `= STRING`
sets a comment describing the field (which is shown at the input/output tool tip).

`hidden` `= BOOL (default: No)`
: sets whether the field should be visible in the MeVisLab network (this can be used to hide existing input/output images).

`priority` `= INT (default: 100)`
: sets the notification priority of the field, a value of 0 means that the field has high priority and GUI controls depending on this field will be updated immediately when the field changes.

`editable` `= BOOL (default: Yes)`
: sets whether the field should be editable by default. Also sets the `persistent` attribute to the same value (if not specified explicitly).

`persistent` `= BOOL (default: Yes)`
: sets whether the field value should be stored in networks (save to disk and copy+paste).

`isFilePath` `= BOOL (default: No)`
: See Interface isFilePath tag.

`min` `= FIELDEXPRESSION`
: See Interface min tag.

`max` `= FIELDEXPRESSION`
: See Interface max tag.

`visibleOn` `= FIELDEXPRESSION`
: See Interface visibleOn tag.

`dependsOn` `= FIELDEXPRESSION`
: See Interface dependsOn tag.

`deprecatedName` `= NAME`
: sets an old name to the field which allows to rename fields in MacroModules/C++ and keep old networks and scripts working. If the `deprecatedName` appears anywhere in a GUI description, a stored network or in scripting, it is automatically mapped to the name of this field

  (any number of `deprecatedName` tags can be given. They are all parsed)

`removed` `= BOOL (default: No)`
: declares this field as being removed and avoids warnings when a network is loaded which contains stored values for the (removed) field.

`items`
: specifies the enumeration items if the field is of type Enum.

  `item` `= NAME`
  : specifies the (token) name of the item.

    `title = STRING`

    specifies the user visible name of the item.

    `deprecatedName = STRING`

    specifies an old deprecated name for the item which can be used on setStringValue and which causes the enum to take the value of item instead of the old value.

    This tag is used to allow old networks and scripts to work even if enum items have changed or have gone away completely.

2.3. Commands

The commands section is used to add script files and commands to the module.

The general sequence for a module initialization is:

1. Initialization of Modules fields
2. Script call to `initCommand`
3. Creation of FieldListeners
4. Restoration of outside field connections to other modules in a loaded network
5. Script call to `wakeupCommand`

The detailed order is:

1. Creation of the internal C++ ML/Inventor class or loading the internal MeVisLab network of the MacroModule
2. Reading internal fields from C++
3. Creation of self/instanceName fields
4. Creation of Interface fields (given in the `Interface` section) and parsing of tags in the `Interface` and `Description` section (except for min/max values)
5. Restore of persistent stored fields (via setStringValue)
6. Loading of Python given in Commands `source` tags
7. Creation of min/max values (from the `Interface` and `Description` section)
8. Script call to `initCommand`
9. Creation of FieldListeners given in the `Commands` section
10. Field connections to other modules in a network that is restored (from disk or paste buffer) are done
11. Script call to `wakeupCommand`

```
Commands {
  source             = FILE

  // more source files...

  importPath = PATH

  // more importPath tags...


  initCommand         = SCRIPT
  wakeupCommand       = SCRIPT
  finalizeCommand     = SCRIPT
  droppedFileCommand  = SCRIPT
  droppedFilesCommand = SCRIPT

  storingToUndoHistoryCommand    = SCRIPT
  restoredFromUndoHistoryCommand = SCRIPT

  moduleItemCreatedCommand = SCRIPT

  runApplicationCommand = SCRIPT

  FieldListener [FIELD] { ... }
  ...
}
```

`source` `= FILE`

sets a script file to be loaded in the script context of this module. Python variables, classes and functions declared in the file are available in all script calls to this module. This tag can be used for multiple files, the files are parsed in the order of declaration

The file extension `.py` specifies Python script files.

Example: `source = $(LOCAL)/ModuleName.py`

`importPath` `= PATH`
adds a directory to the import path of the module's Python package. Each instance of a MeVisLab module has its own Python package containing different instances of the specified source modules. Python modules and packages from the import path must be imported relatively (see section Intra-package References of the Python documentation).

Example: `importPath = $(LOCAL)/../../Wherever/YourSharedPythonModules`

`initCommand` `= SCRIPT`
defines a script command that is called when the module is created on a network. At the time of this call, the field connections to other modules in the network have not yet been established.

`wakeupCommand` `= SCRIPT`
defines a script command that is called after the module is created on a network and all other modules have been also created and after all field connections have been established.

`finalizeCommand` `= SCRIPT`
defines a script command that is called when the module's script context is deleted. It can be used to cleanup resources that need to be removed or cleared.

This command is called when a module is reloaded or when it is finally deleted, which may occur later than expected because of the undo/redo buffer.

(Typically all Python resources are cleaned automatically, so you will probably never need this command.)

`droppedFileCommand` `= SCRIPT`
defines a script command that is called when the user drops a file, directory or URL on the module's box on the network (e.g., used in ImageLoad to accept dropped filenames).

`droppedFilesCommand` `= SCRIPT`
defines a script command that is called when the user drops files, directories or URLs on the module's box on the network (e.g., used in ImageLoad to accept dropped filenames).

`storingToUndoHistoryCommand` `= SCRIPT`
defines a script command that is called when a module is removed from the network and placed into the undo history

`restoredFromUndoHistoryCommand` `= SCRIPT`
defines a script command that is called when a module is readded to the network from the undo history

`moduleItemCreatedCommand` `= SCRIPT`
defines a script command that is called when the network model item gets created. This typically happens when then network becomes visible in the MeVisLab IDE.

`runApplicationCommand` `= SCRIPT`
defines a scripting command that is called when a macro module is started as an application, before the macro's window is shown.

Note

This command is only available with a valid ADK license. Have a look at the ADK documentation, chapter Advanced Commands for further information.

`FieldListener` `[FIELD]`
the Commands section can contain multiple FieldListeners, see FieldListener for details on what a FieldListener can be used for. The listeners declared in the commands section are active after the

module has been created until the module is deleted. This is typically used to provide functionality to a MacroModule's fields and react on field changes which are independent of the user interface. If you want to have a FieldListener that changes the user interface, use a FieldListener inside of a GUI control somewhere in a Window.

Note

Scripting methods and functions without parameter can be called by a `command` by a simple:

```
command = methodName
```

If the called method or function needs parameters, the scripting string needs to be escaped:

```
command = "* py: methodName(1,2,3) *"
```

2.4. Persistence

This sections allows to make the values of internal fields of a MacroModule persistent. It allows to specify a list of fully qualified field names as well as fields grouped by internal modules. In contrast of defining a field on the interface of the macro module, only its value is stored and restored, the persistent fields are not available on the macro module interface. A typical use case is making internal settings persistent.

```
Persistence {
    fields = FIELDLIST
    ...
    Module NAME {
      fields = FIELDLIST
      ...
    }
    ...
}
```

`fields` `= FIELDLIST`
: defines the fields that are to be stored as a comma-separated list, typically modulename.fieldname (the tag can be used multiple times).

`Module` `= NAME`
: defines a section for fields of the given module (the tag can be used multiple times). The fields listed in the Module tag are given without the leading module name, since that is already given by the section.

2.5. Deployment

This section allows to tell MeVisLab about dynamic dependencies of the module that are required when the module should be deployed to another computer. The `ModuleDependencyAnalyzer` module allows to find most dependencies automatically, but if you, e.g., depend on other directories or if you add modules dynamically in your module, you need to specify these in the `Deployment` section. All tags that are listed below can appear multiple times inside of the same Deployment section.

```
Deployment {
    directory = PATH
    ...
    file = FILE
    ...
    module = NAME
    ...
    DLL = NAME
    ...
    library = NAME
    ...
    objectWrapper = NAME
    ...
    widgetControl = NAME
    ...
    preloadDLL = NAME
    ...
    scriptExtension = NAME
    ...
    remoteBaseHandler = NAME
    ...

    // section for files to be deployed on the web server (feature no available with public SDK)
    Web {
      directory = PATH
      ...
      file = FILE
      ...
    }
}
```

`directory` `= PATH`
defines an additional directory that this module depends on.

`file` `= FILE`
defines an additional file that this module depends on.

`module` `= NAME`
defines an additional module that this module depends on.

`DLL` `= NAME`
defines an additional DLL that this module depends on. The name is given without system-specific pre-/postfix, so that the tag works cross platform. The DLL is copied to the bin folder of the standalone application.

`library` `= NAME`
defines an additional library that this module depends on. The dependency analyser will look for a NAME.mli file in all Packages inside the Configuration/Installers/Libraries directory. A typical use-case is to add a complete ThirdParty library, including the license information and further files. Have a look in MeVis/ThirdParty/Configuration/Installers/Libraries for example *.mli files.

`objectWrapper` `= NAME`
defines an additional ObjectWrapper that this module depends on. The will search for the given wrapper and put its *.def file into the installer. For instance `objectWrapper = CSOList` will add the wrapper for CSOList to the installer.

`widgetControl` `= NAME`
defines an additional WidgetControl that this module depends on. The will search for the given WidgetControl and put its *.def file into the installer. For instance `objectWrapper = GLSLTextView` will add the GLSLTextView control to the installer. Note that WidgetControls are typically autodetected, but in DynamicFrame scenarios, it can make sense to use this tag anyways.

`scriptExtension` `= NAME`
defines an additional ScriptExtension that this module depends on. The will search for the given extension and put its *.def file into the installer. For instance `scriptExtension = DicomTools` will add the DicomTools script extension to the installer.

`remoteBaseHandler` `= NAME`
defines an additional RemoteBaseHandler that this module depends on. The will search for the given handler and put its *.def file into the installer. For instance `remoteBaseHandler = AbstractItemModel` will add the AbstractItemModel handler to the installer.

`preloadDLL` `= NAME`
defines an additional PreloadDLL that this module depends on. The will search for the given PreloadDLL and put its *.def file into the installer. NOTE: This does not cause preloading of a DLL directly, it merely searches for the PreloadDLL tag in the global MDL tree and adds the corresponding *.def file to the installer.

2.6. MLModule

Defines a module that contains an C++ image processing module that is derived from a Module in the ML.

Typically used tags can be found at Module.

Dynamic scripting: MLABMLModule

```
MLModule NAME {
  class         = NAME
  DLL           = NAME
  projectSource = PATH

  // tags from Module
}
```

`class` `= NAME (default: same as MLModule NAME)`
sets the name of the C++ module that should be created via the ML runtime system.

> **Tip**
>
> This can be used to have the same internal C++ class for a number of MeVisLab modules with different names and default values, or if you do not want the internal name to appear as the MeVisLab module name.

`DLL` `= NAME`
specifies the dynamic load library where the C++ class for this module is defined in. The name is given without system-specific pre-/postfix.

Example: `DLL = MLBase`

`projectSource` `= PATH`
specifies the path to the project sources. This optional tag is used to make, e.g., the project file available in the module's context menu and the ModuleInspector. MeVisLab looks for the `CMakeLists.txt` in the referenced directory to create/update the project file if needed.

This option should not be needed if a project is placed within a package that is known to MeVisLab. If the project is located at some different place, however, use this option with either an absolute or a relative path.

Example (relative): `projectSource = $(LOCAL)/../../../../../../Foo/Bar/MyProject`

Example (absolute): `projectSource = $(MLAB_MY_PACKAGE)/Sources/ML/MyProject`

2.7. InventorModule

defines a module that contains a C++ visualization module derived from an OpenInventor SoNode or SoEngine class.

Typically used tags can be found at Module.

Dynamic scripting: MLABInventorModule

```
InventorModule NAME {
  class          = NAME
  DLL            = NAME
  projectSource  = PATH
  hasGroupInputs = BOOL   [No]
  hasViewer      = BOOL   [No]
  hybridMLModule = BOOL   [No]

  // tags from Module
}
```

class = NAME (default: same as InventorModule NAME)
: sets the name of the C++ module that should be created via the OpenInventor runtime system.

Tip

This can be used to have the same internal C++ class for a number of MeVisLab modules with different names and default values, or if you do not want the internal name to appear as the MeVisLab module name.

DLL = NAME
: specifies the dynamic load library where the C++ class for this module is defined in. The name is given without system-specific pre-/postfix.

Example: DLL = SoView2D

projectSource = PATH
: see MLModule.

hasGroupInputs = BOOL (default: No)
: sets whether the module is derived from a SoGroup and should have dynamic SoNode inputs.

hasViewer = BOOL (default: No)
: sets whether the module should have a viewer (typically used on SoGroup derived nodes which should have an Inventor Viewer).

hybridMLModule = BOOL (default: No)
: sets whether the InventorModule contains a fully functional MLModule whose fields appear as if they were the fields of the InventorModule. This is an advanced feature and should typically not be used.

2.8. MacroModule

defines a macro module which can contain an internal network. Typically a MacroModule has an Interface section which defines the fields of the macro. The fields can be aliased from internal fields or can be standalone fields.

Typically used tags can be found at Module.

MacroModules should use the `externalDefinition` tag to define their Interface and Windows in an extra "ModuleName.script" file which should be named like the module itself.

If the `externalDefinition` tag is given, MeVisLab automatically loads the network with the same name and the extension ".mlab". If the module only contains scripting and does not require an internal network, use the `scriptOnly` tag to tell MeVisLab.

Dynamic scripting: MLABMacroModule

```
MacroModule NAME {
  scriptOnly          = BOOL    [No]
  onlyOneInstance     = BOOL    [No]

  // tags from Module
}
```

scriptOnly = BOOL (default: No)
: sets wether an internal network is loaded/required.

onlyOneInstance = `BOOL (default: No)`
: sets whether only one instance of this module can be started as an application; additionally created versions just show the already running application. This is used for applications that the user should only be able to start once.

2.9. FieldListener

The FieldListener listens to fields and calls the script command given in the `command` tag whenever the field changes.

The fields are given as the value tag and/or with multiple `listenField` tag.

There are two possible uses for a FieldListener:

1. They can be created in the Commands section of a Module.

2. They can be used anywhere in the control hierarchy of a Window.

   1. If used in the Commands section, the FieldListener is active throughout the whole lifespan of a module instance (from creation to deletion) and reacts to any field changes whether there is an open module panel or not. Because of this, such a FieldListener cannot access the controls of the user interface of the module with scripting, just the fields of the module.

   2. If used somewhere inside of a Window, the FieldListener is an invisible user interface element which is only active (and created) when the Window is actually created. Such a FieldListener can access all other user interface controls within that Window that are named using the `ctx.control(name)` Python function.

Note

Since part of a Window can be created multiple times using the Panel GUI control, multiple instances of the same FieldListener in a Window can exist at the same time and will all work and change the user interface via the `ctx.control(name)`. The limitation to this is that only controls can be accessed that are also cloned by the Panel control, otherwise the `ctx.control(name)` function will return NULL. This means that you should put your FieldListeners (which are in the user interface) close to the GUI elements you are accessing so that they are also clone when a subpanel is extracted.

```
FieldListener [FIELD] {
  init        = BOOL      [No]
  callLater   = BOOL      [No]
  listenField = FIELD

  // ...

  command     = SCRIPT
}
```

listenField = `FIELD`
: listens to the given field.

  This tag can be used multiple times to listen to N fields with the same FieldListener

command = `SCRIPT (arguments: changedField)`
: defines the script command that is executed when one of the fields changes. The changed field is passed as the first argument to the command.

init = `BOOL (default: No)`
: sets whether the command is triggered once when the FieldListener is created. The first of the fields it listens to is passed to the command.

Tip

This is especially useful when the FieldListener updates some user interface control and needs to be initiated initially to provide a correct user interface.

callLater = BOOL (default: No)
: sets whether the field listener is scheduled the next time the event loop is processed and not immediately when the field changes. You will only get one notification if multiple fields changed since the last event loop processing. If more than one field is listened to, the command is called without a field pointer, because the FieldListener does not know which of the fields have changed since the last event loop.

Warning

Be careful, setting callLater to 'Yes' can cause infinite loops of field notifications! Only use it when you know what you are doing!

2.10. NetworkPanel

This section allows to define a basic user interface on the body of the module in the network view. Currently only an info string and a (icon) button are supported.

```
NetworkPanel {
    info = FIELDEXPRESSION

    Button [FIELD] {
      symbol    = FIELDEXPRESSION
      color     = FIELDEXPRESSION
      command   = SCRIPT
      visibleOn = FIELDEXPRESSION
      dependsOn = FIELDEXPRESSION
    }
}
```

info = FIELDEXPRESSION
: defines an expression that returns a string that will be displayed in the module body. See dependsOn for a explanation of how expressions work. Note that there are some special functions that are especially useful in this context:

  A # in front of a field name returns a string with a value that is formatted for display. For enum fields this is the current value's title instead of the raw value, for numeric fields the precision of the value is restricted.

  The replace function can be used to replace constants in a fixed string with field values.

  Note that the resulting string should be short; longer strings might be truncated to avoid overly large module bodies.

Button [FIELD]
: defines a small icon button. A field can be given to get some default functionality: A trigger field will display a reload icon which will touch the field if clicked. A bool field will display a check icon if it is checked and will toggle the field's value if clicked. A color field will display an icon with the current color and will raise a color select dialog if clicked.

  The behavior of the button can be further customized with the following tags:

  symbol = FIELDEXPRESSION
  : defines the symbol to display. There are some pre-defined symbols: recycle, start, stop, pause, check, clear, and deny. It is also possible to give a full file name of an image file. This image should be a white icon on transparent background to support the color tag.

Note that this expects an expression, so if you just want to set a different symbol, you need to write something like

```
symbol = "* "start" *"
```

`color` `= FIELDEXPRESSION`
defines the color for the symbol as an expression. The color can be a web color specification like #FF0A80 (as string) or the value of a color field. Note that to set a static color, it must be written like

```
color = "* "#FF0A80" *"
```

`command` `= SCRIPT`
defines the script command to execute if the button has been clicked. This overrides the default behavior if a field has been specified.

`dependsOn` `= FIELDEXPRESSION`
defines the condition when the button should be clickable. This is useful to indicate some state of the module.

`visibleOn` `= FIELDEXPRESSION`
defines the condition when the button should be visible. It might make sense to hide the button if it is without function in some mode of the module.

Chapter 3. Other Module-Related MDL Features

3.1. Module Genre Definition

A module in MeVisLab can be in part of multiple genres which are given with the **genre** tag. The available genres are given in MeVisLab/Standard/Modules/IDE/Genre.def and can also be extended via user genres.

Note

The names of the genres are defined by the value behind the **Genre** tag. These genre names may not contain spaces or special characters and are used in the genre tag in the modules' definition. If you want a more specific title, you can use the `title` tag of a Genre to define the string visible to the user. string.

Extract of Genre.def:

```
GlobalGenres  {
   Genre FileMain {
      title = File
      Genre = DICOM

      Genre InventorFile {
         title = Inventor
      }
      Genre File {
         title = Misc
      }
   }

   Separator = ""

   Genre ImageMain {
      title = Image
      Genre = Info
      Genre = Scale
      Genre = Generators

      Genre Image {
         title = Misc
      }
   }
   ...
}
```

Example of a module having two genres:

```
MLModule MyModule {
  genre = DICOM,Scale
}
```

If you are a MeVisLab core developer at MeVis, you can add genres in the Genre.def file.

If you are an external developer and you still need your own genres, you can add a **UserGenres** section to your *.def file (on the top level):

```
UserGenres {
  Genre SomebodysGenreMain {
    title = "A longer title for the genre"
    Genre SomebodysGenre {
    }
  }
  Genre +Diffusion {
    Genre DiffExtra {
    }
  }
}
```

As you can see above there are two notations:

1. Adding a new root genre by just giving a Genre tag with the name of the new genre.

2. Extending a known genre with new entries by writing a + and an existing genre name (defined in Genre.def).

Example: `Genre +ImageMain { Genre = SomeNewSubGenre }`

Note

UserGenres and GlobalGenres are only reloaded when MeVisLab is restarted or when the whole database is reloaded.

3.2. ModuleGroup Definition

A module in MeVisLab can be given the membership of one or several ModuleGroups via the **group** tag. A ModuleGroup consists of the group tag id and extra semantic information about this id given via the ModuleGroup tag. The id has to be a single word and should start with your license prefix to avoid mixing groups up. The existing groups can be enabled/disabled in the Preferences Panel of MeVisLab.

There are a number of predefined groups which are used throughout MeVisLab:

- `deprecated` = a modules that is officially gone, only still there to make old stuff work.

- `test` = a module that tests MeVisLab features.

- `example` = a module that shows things as an example.

- `internal` = internal MeVisLab modules which are not visible to the public.

To put your module into a defined group write the following:

```
MLModule SomeModule {
  group = MyOwnGroup
}
```

Now we need extra information on the ModuleGroup to make it appear nicely in the Preferences Panel of MeVisLab.

```
ModuleGroup GROUPNAME {
  owner   = STRING
  title   = STRING
  comment = STRING
  type    = [internal | std]
  shy     = BOOL     [No]
}
```

If you are a MeVisLab core developer at MeVis, you can add your ModuleGroups directly to `MeVisLab/Standard/Modules/IDE/ModuleGroups.def`.

If you are an external developer, just put the additional ModuleGroups into any *.def file in you UserModulePath, they are read automatically.

3.3. Preloading DLLs

Shared Libraries (DLLs) are loaded by MeVisLab when they are needed by a module in a network (see the DLL tag of Section 2.6, “MLModule”). The PreloadDLL tag can be used to force MeVisLab to load a given DLL on startup. This can be useful when your own ML Type Extensions should be loaded on startup of MeVisLab.

The PreloadDLL tag can appear in any *.def file (on the top-level, not nested in other tags):

```
PreloadDLL DLLNAME {}
// or
PreloadDLL = DLLNAME
```

The DLLNAME is given without file extension. On Windows, ".dll" is appended in MeVisLab Release and "_d.dll" in MeVisLab Debug application. Mac OS X uses "libDLLNAME.dylib" to access the shared library. On Linux, "libDLLNAME.so" is used.

The same library may be specified multiple times, in this case it will still be loaded only once.

Chapter 4. GUI Controls

The following chapters give an overview of all possible GUI Controls and their tags. MeVisLab also contains a number of example MacroModules that demonstrate the individual features.

4.1. GUI Example Modules in MeVisLab

The following modules demonstrate the use of the most of the GUI controls. (This list may not be completely up-to-date, try searching for modules starting with Test* in the MeVisLab search.).

- **TestStyles** - how to change the controls appearance (Colors, Fonts, etc.).
- **TestPrototypes** - how to change tag defaults for given GUI controls.
- **TestLayouter** - showing the usage of AlignGroups.
- **TestListView** - showing a scripted ListView.
- **TestModalDialog** - how to create a modal dialog.
- **TestHyperText** - how to use RichText with hyper links.
- **TestDefaultStyle** - showing the default spacings etc.
- **TestComboBox** - showing a scripted ComboBox.
- **TestViewers** - showing different Inventor viewers.
- **TestInventorChildren** - showing how to add inventor nodes dynamically.
- **TestDynamicFrames** - how to change Frame content via scripting.
- **TestTable**, **TestVertical**, **TestSplitterLayout**, **TestHorizontal**
- **TestFieldAccess** - script access to field values, especially vectors, matrices and image properties.
- **TestScriptUtils** - showing the use of global script utility functions.
- **TestTimers** - how to create scripted timers.

Tip

As an all-in-one example module, the **ExampleGUIScripting** module should be studied thoroughly.

4.2. Abstract GUI Controls

Abstract controls cannot be created directly in the MDL, but many concrete GUI controls are derived from these controls to provide their basic behavior/tags.

4.2.1. Control (Abstract)

Control is the base class for all GUI controls and provides a number of tags supported by every control. Some tags given here only make sense when used in the context of a layouter, e.g., `colspan` in Table or `x/y` in Grid.

Dynamic scripting: MLABWidgetControl

```
name      = NAME
panelName = STRING
expandX   = ENUM                 [No]
```

```
expandY   = ENUM                 [No]
stretchX  = INT                  [0]
stretchY  = INT                  [0]
visible   = BOOL                 [Yes]
enabled   = BOOL                 [Yes]
dependsOn = FIELDEXPRESSION
visibleOn = FIELDEXPRESSION

style           = NAME
styleSheetString = STRING
styleSheetFile   = FILE
widgetName       = NAME

// Tags that are only handled by the MeVisLab Web Toolkit
html_class      = STRING
html_style      = STRING
html_styleField = FIELD

// Width and height tags
w    = INT
h    = INT
pw   = INT
ph   = INT
mw   = INT
mh   = INT
maxw = INT
maxh = INT
fw   = INT
fh   = INT

// Control tags that are read by the owning layouter control:
x       = INT
y       = INT
x2      = INT
y2      = INT
scale   = INT         [1]
colspan = INT         [1]
alignX  = ENUM        [Auto]
alignY  = ENUM        [Auto]

// layouter tags for inter control alignment:
alignGroupX      = NAME   (alias: alignGroup = NAME)
alignGroupY      = NAME
childAlignGroupX = NAME   (alias: childAlignGroup = NAME)
childAlignGroupY = NAME
labelAlignGroup  = NAME

tooltip              = STRING
tooltipField         = FIELD
whatsThis            = STRING
droppedFileCommand   = SCRIPT
droppedFilesCommand  = SCRIPT
droppedObjectCommand = SCRIPT
acceptDrops          = BOOL
resizeCommand        = SCRIPT
initCommand          = SCRIPT
destroyedCommand     = SCRIPT

bgMode       = ENUM        [Repeat]
editBgMode   = ENUM
buttonBgMode = ENUM

screenshotCommentCommand = SCRIPT
```

`name` `= NAME (alias: instanceName)`
: sets the name of the control. The control is registered under this name and can be accessed from Python under this name. This is done by using the **`ctx.control("controlname")`** method.

`style` `= NAME`
: defines the style to be used for this control (and for its children, if there are any).

  see also DefineStyle

`styleSheetString` `= STRING`
: see styleSheetFile, uses the given string instead of reading the CSS definition from a file

`styleSheetFile` `= FILE`
: defines the Qt style sheet that should be used for this MDL control and all its children.

Please note that this tag gives you direct access to the underlying Qt Style Sheets and that you should not mix using style sheets and the MDL style tag in the same MDL controls, since the effects that can happen are somewhat undefined. This results in the duality of QPalette/QFont (which are used for the MDL style tags) and Qt Style Sheets which do not work well together (which is a known Qt pitfall we can not do anything about).

The Qt Style Sheet feature offers complete styling of the MDL controls, but it requires some knownledge of the underlying Qt widgets. For simple styling purposes, you should better use the MDL style tag instead. For complete styling of the GUI (e.g., changing the look&feel of TabView, ListView), the Qt Style Sheets provide possibilities far beyond what the MDL style tag offers.

See http://doc.qt.io/qt-5/stylesheet.html for full details.

Tip

The Widget Explorer is a useful tool for developing and debugging style sheets.

`widgetName` `= NAME`
sets the object name of the Qt widget that is managed by the control. This can be used in the ID selector (#<object name>) of the Qt style sheets to apply style sheet rules.

`html_class` `= STRING`
sets the CSS class of the DOM element that is created for this control.

This only has an effect in the MeVisLab Web Toolkit, which is not part of the public SDK.

`html_style` `= STRING`
sets the style attribute of the DOM element that is created for this control to this string.

This only has an effect in the MeVisLab Web Toolkit, which is not part of the public SDK.

`html_styleField` `= FIELD`
sets the style attribute of the DOM element that is created for this control to value of the string field.

This only has an effect in the MeVisLab Web Toolkit, which is not part of the public SDK.

`panelName` `= NAME`
sets a name for this control that can be used by the Panel component to reference this control as a cloned panel in some other GUI.

`expandX` `= ENUM (default: No)`
defines the space requirements of a control. It depends on the layouter (e.g., Vertical, Table) how this requirement is met.

Possible values: Yes, No, True, False, 0, 1, Fixed, Minimum, Maximum, Preferred, MinimumExpanding, Expanding, Ignored

Value	**Meaning**
`Fixed` (aliases: 0, No, False)	The control can never grow or shrink (e.g., the vertical direction of a button).
`Minimum`	The preferredWidth is minimal, and sufficient. The control can be expanded, but there is no advantage to it being larger (e.g., the horizontal direction of a button). It cannot be smaller than the preferredWidth.
`Maximum`	The preferredWidth is a maximum. The control can be shrunk any amount without detriment if other controls need the space (e.g., a separator line). It cannot be larger than the preferredWidth.
`Preferred`	The preferredWidth is best, but the control can be shrunk and still be useful. The control can be expanded, but there is no advantage to it being larger than preferredWidth (the default expandX value).

Value	**Meaning**
`Expanding` (aliases: 1, Yes, True)	The preferredWidth is a sensible size, but the control can be shrunk and still be useful. The control can make use of extra space, so it should get as much space as possible (e.g., the horizontal direction of a horizontal slider).
`MinimumExpanding`	The preferredWidth is minimal, and sufficient. The control can make use of extra space, so it should get as much space as possible (e.g., the horizontal direction of a horizontal slider).
`Ignored`	The preferredWidth is ignored. The control will get as much space as possible.

`expandY` `= ENUM`

defines the space requirements of a control. It depends on the layouter (e.g., Vertical, Table) how this requirement is met.

Possible values: Yes, No, True, False, 0, 1, Fixed, Minimum, Maximum, Preferred, MinimumExpanding, Expanding, Ignored

See expandX for an analogous explanation of the values.

`stretchX` `= INT (default: 0)`

defines the stretch factor in X direction.

`stretchY` `= INT (default: 0)`

defines the stretch factor in Y direction.

`visible` `= BOOL (default: Yes)`

sets whether the control is visible initially. It can be set to (in-)visible later by using the `setVisible(bool)` method on the control.

`enabled` `= BOOL (default: Yes)`

sets whether the control is enabled. It can be changed by using `setEnabled(bool)` on the control.

`dependsOn` `= FIELDEXPRESSION` **`visibleOn`** `= FIELDEXPRESSION`

makes the control dependent on the given expression. If the expression changes its Boolean value, the control is automatically enabled/disabled (for dependsOn) or shown/hidden (for visibleOn).

Examples:

```
// normal Boolean field dependency:
dependsOn = someBoolField

// negated normal Boolean field dependency:
dependsOn = !someBoolField

// enable only when enum field has given string value:
dependsOn = "* someEnumField == "SomeValue" *"

// enable only when enum field has given string value and the bool field is true:
dependsOn = "* someEnumField == "SomeValue" && someBoolField *"

// enable only when enum field contains one of the given values: (using a regexp)
dependsOn = "* someEnumField == /(SomeValue|SomeOtherValue)/ *"

// enable only when enum field is identical to one of the given values: (using a regexp)
dependsOn = "* someEnumField == /^(SomeValue|SomeOtherValue)$/ *"

// the above can also be written with a number of compares, note that due to the
// precendence, no parenthesis are needed:
dependsOn = "* someEnumField == "SomeValue" || someEnumField == "SomeOtherValue" *"

// numerical comparison:
dependsOn = " someNumberField < 12 "

// numerical comparison with function:
dependsOn = " abs(maxField-minField) >= 1 "
```

Tip

When you use string constants inside the expression, it is easiest to quote the MDL string with "* ... *" so that you do not have to escape the individual quotes of the string.

Tip

Besides standard operators known from C++ there are some predefined functions:

`min(arg0, arg1, ...)`
: Returns the minimum of all given numeric arguments.

`max(arg0, arg1, ...)`
: Returns the maximum of all given numeric arguments.

`abs(arg)`
: Returns the absolute value of the numeric argument.

`if(condition, argTrue, argFalse)`
: Returns argument argTrue if condition evaluates to true otherwise returns argFalse.

`replace(arg0, arg1[, arg2])`
: Searches for all occurrences of arg1 in string arg0 and replaces it with arg2. arg1 may be a string or a regular expression. If no arg2 is given matches are simply removed.

w = INT (alias: **width**) **h** = INT (alias: **height**)
: sets the width/height in pixels (this implicitly sets the minimum and preferred size).

pw = INT (alias: **preferredWidth**) **ph** = INT (alias: **preferredHeight**)
: sets the preferred width/height in pixels.

Tip

Not all controls currently support preferred width, some controls have their own default sizes.

mw = INT (alias: **minimumWidth**) **mh** = INT (alias: **minimumHeight**)
: sets the minimum width/height in pixels (a control cannot get any smaller than this size).

maxw = INT (alias: **maximumWidth**) maxh = INT (alias: **maximumHeight**)
: sets the maximum width/height in pixels (a control cannot get any bigger).

fw = INT (alias: **fixedWidth**) fh = INT (alias: **fixedHeight**)
: sets all above width/height sizes to the same value (the control will not change size in any layouter).

scale = INT (default: 1)
: scales all sizes (margin/spacing/fonts) in fixed steps.

Positive integer values enlarge the control, negative values shrink it.

This is also applied to all child controls of a widget, so you can scale whole groups of controls with one scale tag.

This feature works additive and recursive , so you can also resize in a hierarchy.

Tip

This feature replaces and extends the old ILAB4 styles defaultSmall, defaultBig, etc., which should no longer be used.

alignGroupX = NAME (alias: **alignGroup**)**childAlignGroupX** = NAME (alias: **childAlignGroup**) **childAlignGroupY** = NAME**labelAlignGroup** = NAME

see Section 4.9.1, “Align Groups”for details on the usage of these tags

alignGroupY = NAME

specifies that this control is in a vertical aligngroup.

see Section 4.9.1, “Align Groups”for details on the usage

tooltip = STRING

sets a string used as tool tip. This can be changed by Python with the `setToolTip(string)` method.

Note that the first sentence of a help text of the mhelp document is used as the tool tip text when no explicit tool tip is given here (and of course, if a mhelp files exists).

Instead of using the tooltip tag, rather write the field's help in the mhelp format. Avoid having multiple places where the field's help has to be modified in case of a change.

Note

The automatic display of the field's help is deactivated by default if the panel is displayed in an application context, since it is assumed that the help is written for developers rather than for end users.

If you want to show the field help anyway, you can set the variable "ShowFieldHelpInApplications" to "true", either in the preferences file of the application, or with `MLAB.setVariable()` (must be set before a panel is created or shown). Also note that mhelp files are excluded from application installers by default.

tooltipField = FIELD

provides the tool tip for the control, precedes the tooltip tag.

whatsThis = STRING

sets a string used as tool tip. This can be changed by Python with the `setWhatsThis(string)` method.

Control tags that affect the control's layouters (depending on in which layouter the control is created, e.g., Table, Grid):

alignX = ENUM (default: Auto)

specifies the alignment of the control, which automatically means that the control is not expanded in that direction but aligned in its row/column.

This tag is used by the layouters a control is placed in, e.g., Table , Grid , Vertical and Horizontal.

Possible values: Auto, Left, Right, Center

alignY = ENUM (default: Auto)

specifies the alignment of the control, which automatically means that the control is not expanded in that direction but aligned in its row/column.

This tag is used by the layouters a control is placed in, e.g., Table , Grid , Vertical and Horizontal.

Possible values: Auto, Top, Bottom, Center

x/y = INT

sets the column/row position of control in the Grid or sets the x/y position inside a FreeFloat layouter.

(Grid and FreeFloat layouters only, required tag!)

`x2/y2` `= INT`

sets a multicell column/row position for grid, the control spans the column from `x` to `x2`.

(Grid layouter only.)

`colspan` `= INT (default: 1)`

sets the column span used in Table layouter.

`bgMode` `= ENUM (default: Repeat)`

`editBgMode` `= ENUM`

`buttonBgMode` `= ENUM`

defines how background images in the style colors **bg** , **editBg** and **button** are drawn. The default is repeating of the image which Qt grants us for free. All other modes have some kind of performance or memory penalty, but can give nice background effects. Especially the "smooth" modes are expensive.

`Stretch, SmoothStretch`

Stretches the image to the current size of this control.

`StretchX, StretchY, SmoothStretchX, SmoothStretchY`

Stretches the image in X/Y direction, repeat in the other direction. This can be used to have a gradient effect with an image.

`Fit, SmoothFit`

Resizes the image so that it fits in the available space while keeping the aspect ratio. The border is filled with the color given in the style.

`TopLeft,TopRight,BottomLeft,BottomRight,Center`

Image is positioned in corner/center of control and not resized.

`Repeat`

Image is repeated continuously (so the image used should match nicely with its borders).

`ResizedBox (Advanced!)`

Image is split in 9 parts which are stretched differently, *ModeBorderX + *ModeBorderY tags select the corner box size that is not stretched.

Possible values: Repeat, Stretch, SmoothStretch, Fit, SmoothFit, TopLeft, TopRight, BottomLeft, BottomRight, Center, ResizedBox

For specification of background images, see the Style section.

Advanced features:

`droppedFileCommand` `= SCRIPT`

defines a script that is executed when a file, directory or URL is dropped onto the control. If multiple files were dropped then this is called multiple times

arguments: (string filename)

`droppedFilesCommand` `= SCRIPT`

defines a script that is executed when files, directories or URLS are dropped onto the control.

arguments: (list filenames)

`droppedObjectCommand` `= SCRIPT`

defines a script that is executed when an object is dropped onto the control.

arguments: (qobject object)

acceptDrops = BOOL
sets whether the object accepts dropping of objects. If one of the above commands is set, this is automatically set to 'Yes'.

Typically this is set to 'Yes' manually, if you want to handle drag-and-drop on a very low level, e.g., with an EventHandler.

resizeCommand = SCRIPT
defines a script that is executed whenever the control is resized on the screen. This can be used to make other controls visible/invisible, depending on the available space. It can also be used to do your own layouting in a FreeFloat by repositioning controls whenever the size of the FreeFloat changes. See the EventFilter for other things that you can react on.

arguments: (none)

initCommand = SCRIPT
defines a script that is executed when the control was created (and before it is actually shown). The control is passed with the call of the script.

arguments: (MLABWidgetControl)

destroyedCommand = SCRIPT
defines a script that is executed immediately before the control is destroyed. At this point the control is already reduced to the basic control object, so you cannot use any feature provided by derived controls! The control is passed with the call of the script.

arguments: (MLABWidgetControl)

Additional control tags for TabViewItems are given in TabViewItem, any control can be used as a TabViewItem.

4.2.2. Frame (Abstract)

Frame is an abstract control which allows to set tags that control the frame appearance. A number of controls are derived from this control.

Frame is derived from Control.

Dynamic scripting: MLABFrameControl

```
frameShape        = ENUM    [NoFrame]
frameShadow       = ENUM    [Plain]
frameLineWidth    = INT     [1]
frameMidLineWidth = INT     [1]
```

frameShape = ENUM (default: NoFrame)
sets the shape of the frame, the possible values are:

NoFrame, Box, Panel, WinPanel, HLine, VLine, StyledPanel, PopupPanel, MenuBarPanel, ToolBarPanel, LineEditPanel, TabWidgetPanel, GroupBoxPanel, MShape

frameShadow = ENUM (default: Plain)
sets the type of the frame's shadow, the possible values are:

Plain, Raised, Sunken, MShadow

frameLineWidth = INT (default: 1)
sets the line width of the frame.

frameMidLineWidth = INT (default: 1)
sets the mid line width.

4.2.3. Execute

Execute can be used to execute a script function anywhere in a GUI definition. It can be placed in any Control that supports children. It does not create a visible control but just executes the given scripting function which may be defined via the **source** tag in the Commands section of the module. For Python, it is also allowed to execute inline code that starts with "py:". The given function can also be a child of an existing object written in dotted notation, e.g., "myObject.myFunction".

```
Execute = someFunction
Execute = "*py: MLAB.log("test") *"
Execute = "py: MLAB.log('test') "
```

The Execute statement has access to all controls that are "named" with the **name** tag and that appear BEFORE the Execute statement. Controls following after the Execute statement cannot be reached. An example for accessing a Control is given below.

Note

Generally it is not a good idea to use inline code, because it messes up your GUI interface. It is not possible to define your own functions and classes in the inline code, so you should prefer doing the scripting in external files given via source.

```
Label   = "Test" { name = mylabel }
Execute = "*py: ctx.control("label").setTitle("Title Changed"); *"
```

4.3. Layout Group Controls

The following controls group other control together and define how these child controls are laid out. Window is a special case, since it is the top level control and can only be declared on the top level of a module definition.

4.3.1. Window

Window is the base control that contains any other controls. A module can have any number of Windows in its MDL definition file. The first window (or the one with the name "_default") is used as the standard parameter panel of the module.

Window is derived from Control.

Dynamic scripting: MLABWindowControl

```
Window NAME {
  title                   = STRING
  wakeupCommand           = SCRIPT
  windowActivatedCommand  = SCRIPT
  shouldCloseCommand      = SCRIPT
  maximized               = BOOL        [No]
  canGoFullscreen         = BOOL        [No]
  fullscreen              = BOOL        [No]
  borderless              = BOOL        [No]

  ANYGUICONTROL { }
  ...
}
```

`title` `= STRING`
sets the title shown in the window title bar.

`wakeupCommand` `= SCRIPT`
defines a command that is called when the window is shown, you should better use an Execute command, which is also called when your Window is extracted via a Panel control.

windowActivatedCommand = SCRIPT
: defines a command that is called when the window is activated (i.e. when it gets the keyboard focus).

shouldCloseCommand = SCRIPT
: defines a command that is called when the window is closed by the user or by the program. If you do not want the window to be closed, you can call

```
ctx.window().setCloseAllowed(false)
```

within the script command. The default is that the window can be closed.

maximized = BOOL (default: No)
: sets whether the window will always be shown maximized on the screen.

canGoFullscreen = BOOL (default: No)
: sets whether the window will have a fullscreen button in the upper right of its titlebar. This feature is only supported on Mac OS X 10.7 or later, currently. Furthermore, it only works with application main windows (i.e., use "Run As Application").

fullscreen = BOOL (default: No)
: sets wether the window will always be shown fullscreen, with no window bar decoration and close button.

borderless = BOOL (default: No)
: sets wether the window will have no decoration at all, no close button, etc. Use with care because you cannot close such a window without adding your own close button to it.

ANYGUICONTROL
: Controls defined inside the window are the content of the window. If more than one control is specified, the window automatically uses a TabView and the controls act as TabViewItems.

Example 4.1. Window

Have a look at the `View3D.script` (instantiate a View3D module in MeVisLab, right-click it and choose **Related Files** → **View3D.script** from the context menu). There, you will find four Window sections defined, namely 'View3D', 'Viewer', 'Settings' and 'LutEditor'. All these windows appear in the module's context menu under 'Show Window' below the separator. Above the separator, the default window (always called 'Panel') and the automatic panel are listed.

In the case of the View3D, no Window is named `_default`, so the first window ('View3D') is opened as the default panel on double-clicking the module.

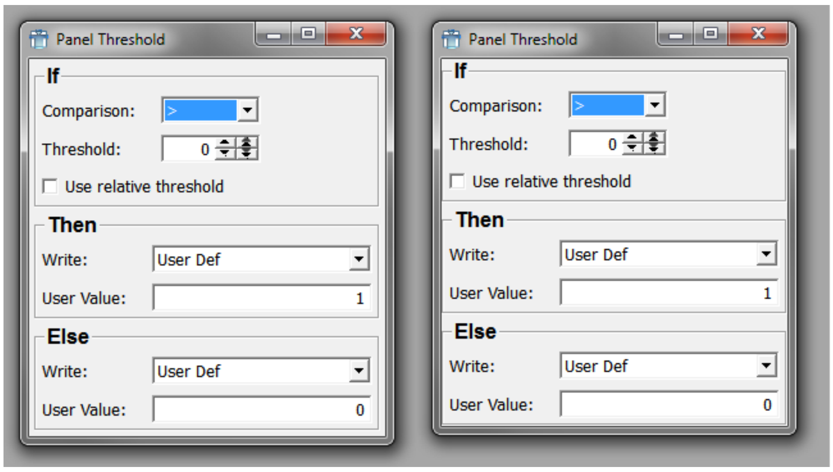
```
Interface  {
  Inputs  {
    // ...
  }
  Outputs  {
    // ...
  }
  Parameters  {
    // ...
  }
}

Description {
  // ...
}

Persistence {
  // ...
}

Commands  {
  source = $(LOCAL)/View3D.py
  wakeupCommand = wakeup

  ContextMenu {
    MenuItem "Show Inventor Inputs" { field = inventorInputOn }
  }
  FieldListener renderer.image {
    // ...
  }
  // ...
}

Window View3D {
 // ...
}

Window Viewer {
  Viewer viewer.self {
    name  = viewer
    clone = No
  }
}

Window Settings {
  Panel {
    panel = Settings
  }
}

Window LutEditor {
  title = "Lut Editor"
  Vertical {
    Box Editor {
      Panel {
        module = SoLUTEditor
        panel  = editor
      }
    }
    Box Settings {
      Field SoLUTEditor.relativeLut        { }
      Field SoLUTEditor.alphaFactor        { slider = Yes }
      Field SoLUTEditor.colorInterpolation { }
    }
    Box Range {
      Panel {
        module = SoLUTEditor
        panel  = range
      }
    }
  }
}
```

4.3.2. Category

Category is an alias of the Vertical with the difference that the Category has a default non-zero margin.

It is recommended use the Category as the top level layouter instead of a Vertical, because otherwise, inner controls might be clipped slightly by the window's border.

Figure 4.1. Category vs. Vertical



Panel Threshold

If

Comparison: >

Threshold: 0

☐ Use relative threshold

Then

Write: User Def

User Value: 1

Else

Write: User Def

User Value: 0

Panel Threshold

If

Comparison: >

Threshold: 0

☐ Use relative threshold

Then

Write: User Def

User Value: 1

Else

Write: User Def

User Value: 0

In the image above, the left window uses a Category as the top level layouter while the right window uses a Vertical instead. Note the clipping of the frames of the boxes by the window to the right.

4.3.3. Vertical

Vertical is a vertical layout group control. Each control inside of the Vertical is laid out according to its size requirements.

The following children's tags are taken into account:

`stretchY`, `expandY`

Vertical is derived from Frame.

Aliases: VerticalNB, Category (see margin, though)

Dynamic scripting: MLABVBoxControl

```
Vertical {
  spacing = INT    [0]
  margin  = INT    [0 for Vertical, nonzero default for Category]

  // Additional tags: see Frame

  ANYGUICONTROL { }
  ...
}
```

`spacing` `= INT (default: 0)`
: spacing between the controls.

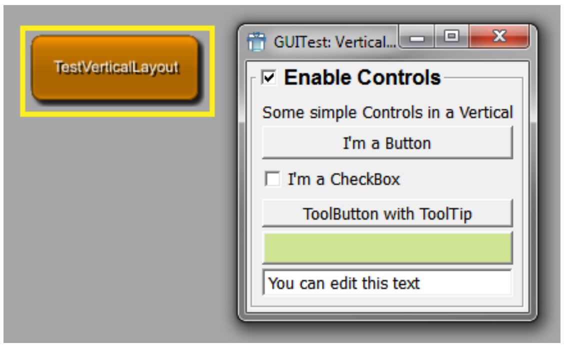
`margin` `= INT (default: auto)`
: spacing between border and controls. The default is 0 pixels for Vertical, but a small non-zero value for Category.

`ANYGUICONTROL`
: all controls declared inside of the group are automatically children of the group.

Example 4.2. Vertical

Have a look at the module **TestVerticalLayout**. This module features some GUI components that are arranged vertically.

Figure 4.2. TestVerticalLayout Module



4.3.4. Horizontal

Horizontal is a horizontal layout group control. Each control inside of the Horizontal is laid out according to its size requirements.

The following children's tags are taken into account:

`stretchX`, `expandX`

Horizontal is derived from Frame.

Aliases: HorizontalNB, ButtonGroup

Dynamic scripting: MLABHBoxControl

```
Horizontal {
  spacing = INT   [0]
  margin  = INT   [0]

  // Additional tags: see Frame

  ANYGUICONTROL { }
  ...
}
```

`spacing` `= INT (default: 0)`
  spacing between the controls

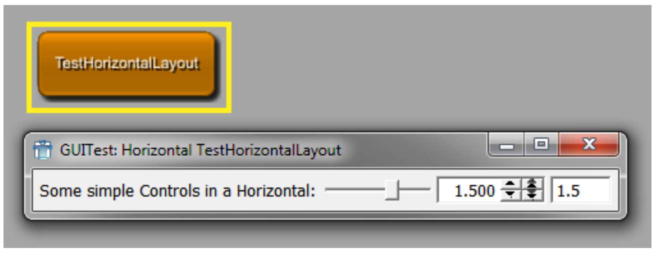
`margin` `= INT (default: 0)`
  spacing between border and controls

`ANYGUICONTROL`
  all controls declared inside of the group are automatically children of the group.

Example 4.3. Horizontal

Have a look at the module **TestHorizontalLayout**. This module features some GUI components that are arranged horizontally.

Figure 4.3. TestHorizontalLayout Module


TestHorizontalLayout
GUITest: Horizontal TestHorizontalLayout
Some simple Controls in a Horizontal:
1.500
1.5

4.3.5. Table

Table organizes its children in rows. Child controls can span multiple columns and can be aligned within their row/column position.

Each control inside of the Table is laid out according to its size requirements, the following children tags are used by the layouter:

`stretchX/Y`, *`expandX/Y`*, *`alignX/Y`*, *`colspan`*

Table is derived from Frame.

Dynamic scripting: MLABTableControl

```
Table {
  spacing = INT    [0]
  margin  = INT    [0]

  // Additional tags: see Frame

  Row {
    visibleOn    = FIELDEXPRESSION
    dependsOn    = FIELDEXPRESSION
    ANYGUICONTROL { }
    ...
  }
  Row {
    visibleOn    = FIELDEXPRESSION
    dependsOn    = FIELDEXPRESSION
    ANYGUICONTROL { }
    ...
  }
  ...
}
```

`spacing` `= INT (default: 0)`
sets the spacing between the controls.

`margin` `= INT (default: 0)`
sets the spacing between border and controls.

`Row`
specifies a row in the table. The row can contain any number of child controls, which can also span multiple column (with the colspan tag used in a control).

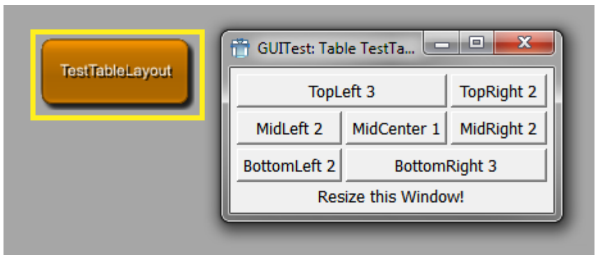
Each row may also contain a dependsOn and visibleOn expression, as described for normal controls. Note that if dependsOn/visibleOn expressions are also specified for the children of the row, unspecified behavior may occur.

Example 4.4. Table

Have a look at the module **TestTableLayout**. Below you will find the MDL code that defines this example macro module.

```
scriptOnly = Yes

Window {
  title = "GUITest: Table"

  Table {
    margin  = 5
    spacing = 3

    Row {
      Button {
        colspan = 3
        title   = "TopLeft 3"
        expandX = Yes
        expandY = Yes
      }

      Button {
        colspan = 2
        title   = "TopRight 2"
        expandX = Yes
        expandY = Yes
      }
    }

    Row {
      Button {
        colspan = 2
        title   = "MidLeft 2"
        expandX = Yes
        expandY = No
      }

      Button {
        colspan = 1
        title   = "MidCenter 1"
        expandX = No
        expandY = Yes
      }

      Button {
        colspan = 2
        title   = "MidRight 2"
        expandX = Yes
        expandY = No
      }
    }

    Row {
      Button {
        colspan = 2
        title   = "BottomLeft 2"
        expandX = Yes
        expandY = Yes
      }

      Button {
        colspan = 3
        title   = "BottomRight 3"
        expandX = Yes
        expandY = Yes
      }
    }

    Row {
      Label "Resize this Window!" {
        colspan = 5
        alignX  = Center
      }
    }
  } // wrap
}
```

Figure 4.4. TestTableLayout Module



4.3.6. Grid

Grid organizes its children in rows and columns. Child controls can be positioned at any row/column position and can span multiple columns and can be aligned within their row/column position.

Each control inside of the Grid is laid out according to its size requirements, the following children tags are used by the layouter:

`stretchX/Y`, *`expandX/Y`*, *`alignX/Y`*, *`x`*, *`y`*, *`x2`*, *`y2`*

Grid is derived from Frame.

Dynamic scripting: MLABGridControl

Tip

Each child control needs to have a `x/y` position tag.

In contrast to Table, where controls are automatically ordered in rows, the Grid allows more complex positioning.

```
Grid {
  spacing = INT    [0]
  margin  = INT    [0]

  // Additional tags: see Frame

  // simple control:
  ANYGUICONTROL { x = INT y = INT }

  // multicolumn control:
  ANYGUICONTROL { x = INT y = INT x2 = INT y2 = INT }
  ...
}
```

`spacing` `= INT (default: 0)`
: sets the spacing between the controls.

`margin` `= INT (default: 0)`
: sets the spacing between border and controls.

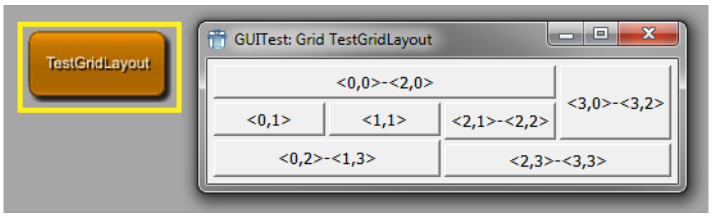
`ANYGUICONTROL`
: specifies a child control (which is positioned at the row and column given by the `x` and `y` tags in the Grid), either as a row in the table, the row can contain any number of child controls, which can also span multiple column (with the colspan tag used in a control).

Example 4.5. Grid

Have a look at the module **TestGridLayout**. Below you will find the MDL code that defines this example macro module.

```
scriptOnly = yes

Window {
  title = "GUITest: Grid"

  Grid {
    margin  = 5
    spacing = 3

    Button {
      x  = 0
      y  = 0
      x2 = 2
      Y2 = 0
      title   = "<0,0>-<2,0>"
      expandX = Yes
      expandY = Yes
    }
    Button {
      x  = 3
      y  = 0
      x2 = 3
      y2 = 2
      title   = "<3,0>-<3,2>"
      expandX = Yes
      expandY = Yes
      alignX = Right
    }
    Button {
      x = 0
      y = 1
      title   = "<0,1>"
      expandX = Yes
      alignX  = Left
    }
    Button {
      x = 1
      y = 1
      title   = "<1,1>"
      expandY = Yes
      alignY  = Top
    }
    Button {
      x  = 2
      y  = 1
      x2 = 2
      y2 = 2
      title   = "<2,1>-<2,2>"
      expandX = Yes
      expandY = Yes
    }
    Button {
      x  = 0
      y  = 2
      x2 = 1
      y2 = 3
      title   = "<0,2>-<1,3>"
      expandX = Yes
      expandY = Yes
    }
    Button {
      x  = 2
      y  = 3
      x2 = 3
      y2 = 3
      title   = "<2,3>-<3,3>"
      expandX = Yes
      expandY = Yes
      alignY  = Bottom
    }
  }
}
```

Figure 4.5. TestGridLayout Module



4.3.7. ButtonBox

ButtonBox is a control that presents Button controls in a layout that is appropriate for the operating system's look & feel. Dialogs typically present buttons in a layout that conforms to the interface guidelines for that platform. A ButtonBox automatically uses the appropriate layout of the user's desktop environment, and may change the order in which the child buttons appear.

Dynamic scripting: MLABButtonBoxControl

```
ButtonBox {
  orientation = ENUM    [Horizontal]

  // Button control:
  Button { role = ENUM }
  ...
}
```

`orientation` `= ENUM (default: Horizontal)`
sets the the orientation of the button box.

Possible values: Horizontal, Vertical

`Button`
specifies a Button control. The role attribute of a Button is used to determine the role of the button within a dialog window. See Button control for possible values.

If the button does not specify a role, the button title will be evaluated for know role strings. Currently known strings are: Ok, Open, Save, Cancel, Close, Discard, Apply, Reset, Restore Defaults, Help, Save All, Yes, Yes To All, No, No To All, Abort, Retry, Ignore

4.3.8. Splitter

Splitter organizes its children in vertical or horizontal direction and allows to resize the contained controls with draggable handles. The color and shadow of the splitter are customizable.

Each control inside of the Splitter is laid out according to its size requirements. The following children tags are used by the layouter:

`stretchX/Y`, *`expandX/Y`*

Splitter is derived from Frame.

Dynamic scripting: MLABSplitterControl

```
Splitter {
  direction           = ENUM
  color               = COLOR
  shadow              = ENUM     [Raised]
  childrenCollapsible = BOOL     [Yes]
  // Additional: tags for frame

  ANYGUICONTROL { }
  ...
}
```

`direction` `= ENUM`
    defines layout direction of the Splitter.

    Possible values: Vertical, Horizontal

`color` `= COLOR`
    sets the the color which the splitter should have.

`shadow` `= ENUM (default: Raised)`
    defines the the type of shadow of the splitter. Possible values are Plain, Raised and Sunken.

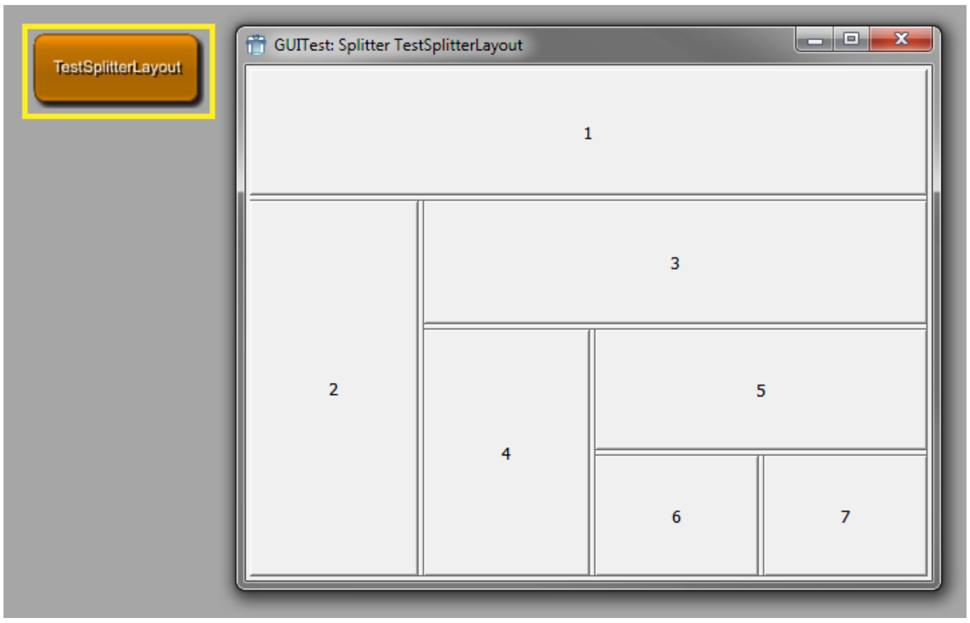
`childrenCollapsible` `= BOOL (default: Yes)`
    defines if the child widgets can be collapsed completely by dragging the splitter.

Example 4.6. Splitter

Have a look at the module **TestSplitterLayout**. Below you will find the MDL code that defines this example macro module.

```
scriptOnly = Yes

Window {
  title = "GUITest: Splitter"
  w     = 512
  h     = 384

  Splitter {
    direction = Vertical

    Button {
      title   = "1"
      expandX = Yes
      expandy = Yes
    }
    Splitter {
      direction = Horizontal

      Button {
        title   = "2"
        expandX = Yes
        expandy = Yes
      }
      Splitter {
        direction = Vertical

        Button {
          title   = "3"
          expandX = Yes
          expandy = Yes
        }
        Splitter {
          direction = Horizontal

          Button {
            title   = "4"
            expandX = Yes
            expandy = Yes
          }
          Splitter {
            direction = Vertical

            Button {
              title   = "5"
              expandX = Yes
              expandy = Yes
            }
            Splitter {
              direction = Horizontal

              Button {
                title   = "6"
                expandX = Yes
                expandy = Yes
              }
              Splitter {
                direction = Vertical

                Button {
                  title   = "7"
                  expandX = Yes
                  expandy = Yes
                }
              }
            }
          }
        }
      }
    }
  }
}
```

Figure 4.6. TestSplitterLayout Module



4.3.9. Box

Box shows a frame with a title around its children. It can contain any inner layout, which is selected by the `layout` tag. If no layout is chosen, a Vertical is implicitly used. Note that all child tags of the Box are also used by the selected layout, e.g., the `margin` tag.

Dynamic scripting: MLABBoxControl

```
Box STRING {
  title          = STRING
  titleField     = FIELD
  alignTitle     = ENUM    [Left]
  layout         = NAME    [Vertical]
  checked        = BOOL    [No]
  checkable      = BOOL    [No]
  checkedField   = FIELD

  ANYGUICONTROL { }
  ...
}
```

`title` `= STRING`
: overwrites the title given in Box tag.

`titleField` `= FIELD`
: provides the title of the Box, precedes the title tag.

`alignTitle` `= ENUM (default: Left)`
: sets the alignment of the title.

  Possible values: Left, Center, Right

`layout` `= NAME (default: Vertical)`
: defines a layouter.

  Possible values: Category, Vertical, Horizontal, Table, Grid, Splitter, FreeFloat

`checkedField` `= FIELD`
: checkedField can be a Boolean field. Its value is used to toggle the checked state which enables/disables the content of the box.

`checkable` = BOOL (default: No)
: sets whether a checkbox appears in the title of the box which enables/disables the content of the box.

`checked` = BOOL (default: No)
: sets the checked state which indicates if the content of the box is enabled or disabled. This attribute will be overwritten if checkedField is given.

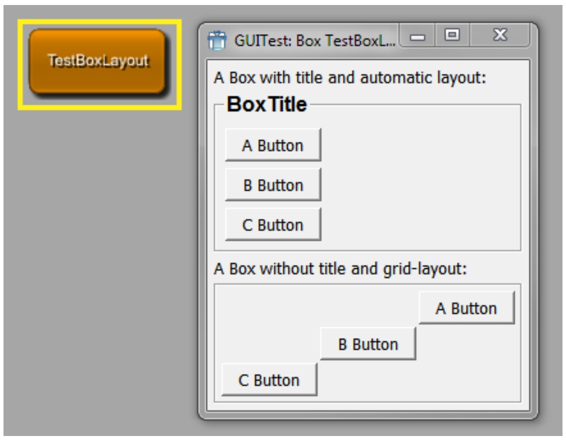
Note: There is a known Qt bug that causes the box contents to overlap with the checkbox if the box has no title

Example 4.7. Box

Have a look at the module **TestBoxLayout**. Below you will find the MDL code that defines this example macro module.

```
scriptOnly = yes

Window {
  title = "GUITest: Box"

  Vertical {
    margin  = 5

    Label "A Box with title and automatic layout:" {}
    Box BoxTitle {
       spacing = 5
       margin  = 5
       Button { title = "A Button" }
       Button { title = "B Button" }
       Button { title = "C Button" }
    }

    Label "A Box without title and grid-layout:" {}
    Box {
       spacing = 2
       margin  = 2
       layout = Grid

       Button { title = "A Button" x = 2 y = 0}
       Button { title = "B Button" x = 1 y = 1}
       Button { title = "C Button" x = 0 y = 2}
    }
  }
}
```

Figure 4.7. TestBoxLayout Module



4.3.10. ScrollView

ScrollView allows to scroll a bigger control with vertical and horizontal scrollbars. If not layout is specified, the internal layout is a Vertical layout.

ScrollView is derived from Frame.

Dynamic scripting: MLABScrollViewControl

```
ScrollView {
  layout     = NAME    [Vertical]
  hscroller = ENUM    [Auto]
  vscroller = ENUM    [Auto]

  // Additional: tags for frame

  ANYGUICONTROL { }
  ...
}
```

hscroller = ENUM (default: Auto)
: sets whether the horizontal scrollbar is always on, off or should only appear when needed (auto).

  Possible values: Auto, On, Off

vscroller = ENUM (default: Auto)
: sets whether the vertical scrollbar is always on, off or should only appear when needed (auto).

  Possible values: Auto, On, Off

layout = NAME (default: Vertical)
: defines a layouter.

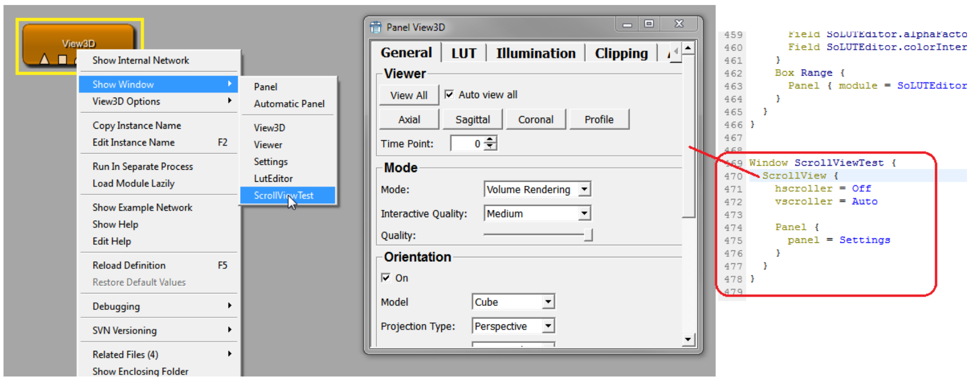
  Possible values: Vertical, Horizontal, Table, Grid, Splitter, FreeFloat

Example 4.8. ScrollView

The following example adds another window to the View3D which then becomes available via the module's context menu (Show Window). It adds the settings panel in a ScrollView with no horizontal scroller but a vertical scroller if the panel's content exceeds the window (which it does).

```
Window ScrollViewTest {
  ScrollView {

    hscroller = Off
    vscroller = Auto

    Panel {
      panel = Settings
    }
  }
}
```

Figure 4.8. ScrollView Example



Time Point: 0
Mode: Volume Rendering
Interactive Quality: Medium
Quality:
On ✓
Model Cube
Projection Type: Perspective

```
        Field SoLUTEditor.alphaFacto
        Field SoLUTEditor.colorInter
      }
      Box Range {
        Panel { module = SoLUTEditor
      }
    }
}


Window ScrollViewTest {
  ScrollView {
    hscroller = Off
    vscroller = Auto

    Panel {
      panel = Settings
    }
  }
}
```

4.3.11. TabView

TabView shows a TabBar and contains a stack of controls that are visible depending on the selected Tab. It also offers a mode where the TabBar is not visible, allowing to change the selected Tab by scripting only (this is often used in applications, which group their panels inside an invisible TabView).

The child controls of the TabView can be any controls. The additional tags needed for the TabView are given as extra tags to the child controls. Refer to TabViewItem to see what tags are available.

The selected tab can be changed by using the `selectTabAtIndex(int)` or `selectTab(controlname)` method on the TabView, or by associating the control with a field of type integer, whose value will be the index of the currently displayed tab (see currentIndexField).

TabView is derived from Control.

Dynamic scripting: MLABTabViewControl

```
 TabView {
  currentIndexField = FIELD     [None]
  mode              = ENUM      [Normal]
  acceptWheelEvents = BOOL      [Yes]

  ANYGUICONTROL { }
  ...
}
```

`currentIndexField` `= FIELD (default: None)`
: synchronizes the current tab index with the value of a field of type integer, i.e., the value of the field changes when the tab is changed and vice versa.

`mode` `= ENUM (default: Normal)`
: defines whether the TabBar is visible and if it is on the top or bottom of the widget. If the mode is "toolbox", a ToolBox widget is used instead of a TabView; this has the advantage of internal scrollbars and the possibility of long tab description. If the mode is "listview", a ListView widget is shown on the left and shows each tab title as an entry in the list. If the ListView mode is enabled, the tabHierarchy tag of each TabViewItem can be used to show a tree structure instead of a flag list.

  Possible values: Normal, Top, Bottom, Left, Right, Invisible, Toolbox, ListView

`acceptWheelEvents` `= BOOL (default: Yes)`
: sets whether the TabView should accept mouse wheel events to flip through its TabViewItems.

`ANYGUICONTROL`
: each control in the TabView is treated as a TabViewItem and can contain the tags given in TabViewItem

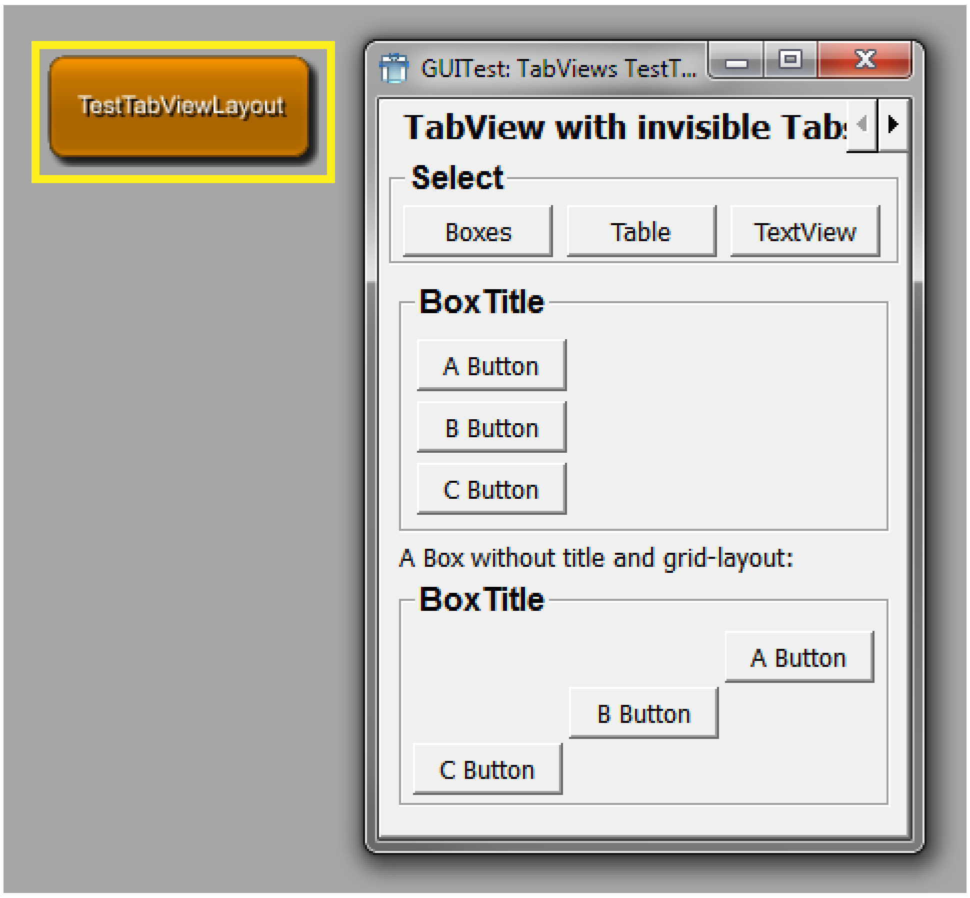
Example 4.9. TabView

Have a look at the module **TestTabViewLayout**. This module features the use of an invisible TabView where the tabs are changed by using scripting commands that are triggered by pressing a button, and the use of standard tabs.

Note that each direct child of a TabView is turned into an own tab.

```
scriptOnly = yes

Commands {
  source = $(LOCAL)/TestTabViewLayout.py
}

Window {
  title = "GUITest: TabViews"

    Vertical "TabView with invisible Tabs" {
      Box Select {
        layout = Horizontal
        Button {  title = "Boxes"    command = switchTab0 }
        Button {  title = "Table"    command = switchTab1 }
        Button {  title = "TextView" command = switchTab2 }
      }

      TabView {
        name = TabViewInvisible
        mode = Invisible

        Vertical {
          tabTitle = "Boxes"
          margin  = 5

          Box BoxTitle { ... }

          Label "A Box without title and grid-layout:" {}

          Box BoxTitle { ...  }

        }


        Table { ... }

        TextView {
          tabTitle = TextView
          title    = TextViewExample
          text     = "Example for a TextView-Control in a TabView"
        }
      }
    }

    TabView "TabView with visible Tabs" {
        Vertical "Boxes" {
          margin  = 5

          Box BoxTitle { ... }

          Label "A Box without title and grid-layout:" {}

          Box BoxTitle { ... }

        }

        Table "Table" { ... }

    }
}
```

Figure 4.9. TestTabViewLayout Module



4.3.11.1. TabViewItem

The TabViewItem can be used inside of a TabView to specify the TabView entries. Any other control can also act as a TabViewItem in the TabView, just add the tags below to the control to pass the needed information to the TabView.

The TabViewItem is a Vertical layouter and has the following tags:

Dynamic scripting: MLABVBoxControl

```
TabViewItem STRING {
  tabIcon     = FILE
  tabTitle    = STRING
  tabInitial = BOOL
  tabTooltip = STRING
  tabHierarchy = STRING

  tabSelectedCommand   = SCRIPT
  tabDeselectedCommand = SCRIPT

  tabEnabled   = BOOL              [Yes]
  tabDependsOn = FIELDEXPRESSION

  ANYGUICONTROL { }
  ...
}
```

tabIcon = FILE
  set an icon to show on the TabBar.

tabTitle = STRING
  sets a title to use in the TabBar (overwrites the value of the TabViewItem tag).

tabInitial = BOOL
selects a TabViewItem as the initially selected Tab (otherwise the first Tab is selected).

tabTooltip = STRING
sets a tool tip text on the TabBar.

tabHierarchy = STRING
defines the hierarchy name of the tab. This can be used in a TabView with mode = ListView to support nested tabs. The separation character is '/'. For example, a value of 'Root/Settings' means that the tab is a child of the TabViewItem with the tabHierarchy name 'Root'. The nesting is unlimited, but the parent TabViewItems need to be declared before the child tab view items. All TabViewItems are defined on the same MDL level/in the same TabView, the nesting is only available in the ListView mode and does not influence the title of the tabs, only the nesting.

tabSelectedCommand = SCRIPT
defines a script command that is called when this TabViewItem is selected (also called on the initial selection).

tabDeselectedCommand = SCRIPT
defines a script command that is called when this TabViewItem is deselected.

tabEnabled = BOOL (default: YES)
sets whether this tab is initially enabled.

tabDependsOn = FIELDEXPRESSION
sets whether this tab is enabled depending on the given field expression. Have a look at the example of this tag for a more detailed explanation.

4.3.12. FreeFloat

FreeFloat organizes its children at a given integer position. The coordinate system starts with (0,0) in the upper left corner.

Each control inside of the FreeFloat is positioned with the tags:

x/y

The size of the controls is taken from the width/height tags:

w/h

FreeFloat is derived from Frame.

Dynamic scripting: MLABFreeFloatControl

Tip

The FreeFloat should ONLY be used where no other layouter works, since it offers fixed control positioning, which can have undesired effects when for example the font size changes. It can be used nicely to have a title image and some floating buttons on the image.

```
FreeFloat {
  autoSize = BOOL

  // Additional: tags for frame

  ANYGUICONTROL { }
  ...
}
```

autoSize = BOOL (default: Yes)
sets whether the FreeFloat automatically calculates its preferred size as the bounding box of all contained controls.

4.4. User Input GUI Controls

User input control are typically tightly coupled with field in MeVisLab, thus allowing an easy way to represent a module's parameter field with a desired user interface. If not stated, all controls are derived from Control and offer its tags.

4.4.1. Field

Field is a very generic control that can show any of the fields in MeVisLab as an editable GUI element. It typically shows a label with the field name (or a given `title`) followed by a number of user-editable controls, e.g., LineEdit, NumberEdit, VectorEdit, ColorEdit, Slider.

It also allows to have field connections by using drag-and-drop of the title label and a pop-up menu to work on the underlying field. Whether drag-and-drop is turned on depends on the window the control is used in. If it is an application window, drag-and-drop is automatically disabled.

Dynamic scripting: MLABFieldControl

```
Field FIELD {
  title                 = STRING
  titleField            = FIELD
  edit                  = BOOL         [Yes]
  validator             = REGEXP
  slider                = BOOL         [No]
  pressedIndicatorField = FIELD
  editField             = BOOL         [Yes]
  format                = STRING
  minLength             = INT          [5]
  hintText              = STRING
  trim                  = ENUM         [None]
  sunkenVectorLabels    = BOOL         [Yes]
  componentTitles       = STRING
  editAlign             = ENUM         [Left]
  textAlign             = ENUM         [Left]
  step                  = FLOAT
  stepstep              = FLOAT
  sliderSnap            = FLOAT
  spacing               = INT          [0]
  alignGroup            = STRING
  enumAutoFormat        = BOOL         [Yes]
  acceptWheelEvents     = BOOl         [Yes]

  comboBox                  = BOOL         [No]
  comboEditable             = BOOL         [Yes]
  comboCompletes            = BOOL         [Yes]
  caseSensitiveAutoComplete = BOOL         [Yes]
  comboSeparator            = STRING       [,]
  comboField                = FIELD

  comboItems {
    item {
      image = FILE
      title = STRING
    }
    ...
  }
  applyButton                            = BOOL       [No]
  moreButton                             = BOOL       [No]
  browseButton                           = BOOL       [No]
  fileDialogCreatesUnexpandedFilenames = BOOL       [No]
  browseMode                             = ENUM       [Open]
  browseTitle                            = STRING
  browseFilter                           = STRING
  browsingGroup                          = STRING
  browseSelectedCommand                  = SCRIPT
  useSheet                               = BOOL       [Yes]
  fieldDragging                          = BOOL
  updateFieldWhileEditing                = BOOL       [No]
}
```

`title` = STRING
    title shown on field label.

titleField = FIELD
: sets the title as a field; it is automatically updated when the field changes and shows the field's string value.

step = FLOAT
: sets a step value used for NumberEdits.

stepstep = FLOAT
: sets a stepstep value used for NumberEdits. The stepstep value is usually smaller than the step value.

sliderSnap = FLOAT
: set a snap value for the slider. If set to a value != 0, the slider always snaps to a value that is a multiple of this value starting at the sliders minimum.

edit = BOOL (default: Yes)
: sets whether the fields value can be edited. If set to 'No', typically text labels are used instead of editable GUI elements.

  (This is different from the general Control tag `enabled`, which enables or disables a whole control (also called "grayed out").)

validator = REGEXP
: Sets a regular expression to check if the input is valid when the value is editable and not a number. A description of the expression syntax can be found here: http://doc.qt.io/qt-5/qregexp.html

slider = BOOL (default: No)
: sets whether a slider is shown. This only works if the field is a number field and has min and max values.

pressedIndicatorField = FIELD
: specifies a Boolean field that is set to true if the user presses the slider button and to false if the user releases the slider button.

editField = BOOL (default: Yes)
: sets whether the GUI element is editable, typically is used to enable the slider without the NumberEdit to the left.

format = STRING
: sets a format string to be used as in sprintf, e.g., %4.5f or %x

Note

You have to use the right %d,%x ,%f,%g type for float/double/int fields.

minLength = INT (default: 5)
: sets a minimum width of characters reserved in the editable GUI element.

hintText = STRING
: sets a hint text shown in editable line edit if line edit is empty and does not have the focus.

updateFieldWhileEditing = BOOL (default: No)
: sets whether the attached field is updated while the user types text in the line edit.

trim = ENUM (default: None)
: does trimming on the string when it is not edited.

  Possible values: Left, Center, Right, None

  Left: "...LongText"

  Center: "Long...Text"

Right : "LongText..."

None: No trimming

`sunkenVectorLabels` `= BOOL (default: Yes)`
: sets whether labels are drawn into the same frame as the LineEdit, otherwise they are drawn separately.

`componentTitles` `= STRING`
: specify titles for the separate component edit boxes of a vector value, overriding the default values. Values must be comma-separated. Extra values will be ignored, if too few values are specified the remaining labels will be unchanged. If this is used on a non-vector field an error is printed.

`editAlign` `= ENUM (default: Left)`
: defines the alignment of the text in the Line/NumberEdits. Default depends on whether numbers or strings are edited.

Possible values: Left, Right, Center

`textAlign` `= ENUM (default: Left)`
: defines the alignment of the text in the title label.

Possible values: Left, Right, Center

`alignGroup` `= STRING`
: sets a hint to which other Fields this Field should be aligned. If the Control should never be aligned, use "None". This is a general feature and is explained in detail in Section 4.9.1, “Align Groups”

`enumAutoFormat` `= BOOL (default: Yes)`
: sets whether enum fields should avoid automatic formatting of enumeration names. Automatic formatting means that a field called "MyName" receives the automatic title "My Name". If the enum items have a common prefix, this is also stripped when automatic formatting is active.

`acceptWheelEvents` `= BOOL (default: Yes)`
: sets whether a combobox or a number field (integer, float, or double) should accept mouse wheel events to adjust its value.

`comboBox` `= BOOL (default: No)`
: sets whether a comboBox is used instead of LineEdit.

`comboEditable` `= BOOL (default: Yes)`
: sets whether the comboxbox string is editable.

`comboCompletes` `= BOOL (default: Yes)`
: sets whether auto complete is used when editable.

`caseSensitiveAutoComplete` `= BOOL (default: Yes)`
: sets whether the combobox auto completion is case sensitive.

`comboField` `= FIELD`
: specifies a field whose string value is used instead of given `comboItems`. When the comboField changes, the available combo list is updated. Note that the field respresenting the selected value is not changed, even if the current value is not in the new combo list.

`comboSeparator` `= STRING (default: ",")`
: sets a string value to use for splitting the string value of comboField into individual values.

`comboItems`
: specifies the items shown in the ComboBox, may be omitted if `comboField` is given.

Each item is specified with the `item` tag.

Each item entry can contain the following tags:

image = FILE
image to be used for the item

title = STRING
title to be used for the item

applyButton = BOOL
sets whether an apply button is generated for VectorEdit. Typically only Rotation has an Apply Button automatically, otherwise it is off by default.

moreButton = BOOL (default: No)
sets whether an additional "..." button is generated that opens a multi-line text edit to edit the field's string value.

browseButton = BOOL (default: No)
sets whether an additional browse button is generated that opens a file dialog at current field value (path).

fileDialogCreatesUnexpandedFilenames = BOOL (default: No)
the file dialog that is shown via the browse button generates absoulte path names, if fileDialogCreatesUnexpandedFilenames is set to No. Otherwise it replaces the beginning of the filename with a variable like $(LOCAL), $(DemoDataPath), if possible.

See also MLABModule::unexpandFilename()

browseMode = ENUM (default: Open)
specifies the type of the file dialog.

Possible values: Open, Save, Directory, OpenReadOnly, DirectoryReadOnly

The ReadOnly variants of these values open a browse dialog that doesn't allow changes to the file system. This might use a non-system browse dialog.

browseTitle = STRING
sets the title of the button for the file dialog

browseFilter = STRING
specifies the file extension filter that is used in open and save mode. You can specify the file types as follows:

```
browseFilter = "All C++ files (*.cpp *.cc *.C *.cxx *.c++);;Text files (*.txt);;All
files (*)"
```

Filters are separated by double-semicolon. The filter is a space-separated list of glob-style expressions enclosed in braces that follow the textual description of the filter.

browsingGroup = STRING
MeVisLab file dialogs store the last used directory, so they can open at the last used location.

If you have applications that load/save data at different locations you can put the dialogs into different browsing groups that store the last used direction separately. Just use different group names (only use letters and numbers in the names).

browseSelectedCommand = SCRIPT
defines the script command to be evaluated when the user made a selection with the file dialog.

useSheet = BOOL (default: Yes)
sets whether any attached dialog (e.g., file dialog) is created as a sheet on Mac OS X. A sheet is a modal dialog attached to a particular document or window.

spacing = INT (default: 0)
sets the internal spacing between the GUI elements of a FieldControl.

wrap = BOOL
: sets whether step and stepstep wrap the value around when reaching the boundaries.

fieldDragging = BOOL
: sets whether the dragging of the fields label onto other field label is possible to create connections. The default is 'Yes' for normal panels and 'No' for standalone applications. This also turns on the connection icons and enables the field context menu on field labels.

```
// Different layouts can be used with certain types of fields:
//
// MLABStringField:
// ----------------
// FieldLabel | <- LineEdit -> | [Browse/Save Button]
//
// If "edit" is 'No', LineEdit is just a Label
//
// MLABBoolField:
// ----------------
// FieldLabel | CheckBox
// (CheckBox is without label on right)
//
// MLABInt/Float/DoubleField:
// -------------------------
// FieldLabel | NumberEdit | [<- Slider if min/max is set and "slider" tag is 'Yes' ->]
//
// If "edit" is 'No', NumberEdit is just a Label
//
// MLABEnumField:
// --------------
// FieldLabel | ComboBox
//
// MLABTriggerField:
// --------------
// FieldLabel | Button
//
// MLABColorField:
// --------------
// FieldLabel | ColorEdit
//
// MLABVec2f/3f/4f/Plane/RotationField:
// -----------------------------------------
// FieldLabel | x | NumberEdit | y | NumberEdit | z | NumberEdit | d | NumberEdit | [Apply Button]
//
// Naming for labels:
// MLABVec2f: x,y
// MLABVec3f: x,y,z
// MLABVec4f: x,y,z,t
// MLABRotation: x,y,z,r
// MLABPlane: x,y,z,d
//
// If "edit" is 'No', NumberEdits are just Labels
```

4.4.2. FieldLabel

FieldLabel shows the draggable label that is used in the Field control. It may be used if one wants to allow a drag/drop connection, e.g., of a matrix, and does not want to show the value of the field.

```
FieldLabel FIELD {
  title      = STRING
  titleField = FIELD
}
```

title = STRING
: sets the title shown on field label.

titleField = FIELD
: sets the title given by a field. It is automatically updated when the field changes and shows the field's string value.

4.4.3. Button

Button shows a clickable button that can either trigger a MLABTriggerField or MLABBoolField or that can call a script given as `command` tag. The button can have multiple images for the different states and it can be a normal or a toggle button.

Dynamic scripting: MLABButtonControl

Tip

You can use & in the button title to add an ALT keyboard shortcut binding to a button. The respective letter will be underlined (e.g., "&Ok").

```
Button [FIELD] {
  title           = STRING
  titleField      = FIELD
  role            = ENUM            [ApplyRole]
  image           = FILE
  accel           = KEYSEQUENCE
  border          = BOOL            [Yes]
  autoRepeat      = BOOL            [No]
  normalOnImage   = FILE
  normalOffImage  = FILE
  activeOnImage   = FILE
  activeOffImage  = FILE
  disabledOnImage  = FILE
  disabledOffImage = FILE
  globalStop      = BOOL            [No]
  fieldDragging   = BOOL

  popupMenu {
    // See definition of SubMenu
  }

  command = SCRIPT
}
```

title = STRING
: sets the title on the button.

titleField = FIELD
: sets the title as a field. The title string is automatically updated when the field changes and shows the field's string value.

role = ENUM (default: ApplyRole)
: defines the role of the button in the window/dialog. It is evaluated if the button has been placed within a ButtonBox container.

Possible values are:

`AcceptRole`
: Clicking the button causes the dialog to be accepted (e.g., OK).

`RejectRole`
: Clicking the button causes the dialog to be rejected (e.g., Cancel).

`DestructiveRole`
: Clicking the button causes a destructive change (e.g., for Discarding Changes) and closes the dialog.

`ActionRole`
: Clicking the button causes changes to the elements within the dialog.

`HelpRole`
: The button can be clicked to request help.

`YesRole`
: The button is a "Yes"-like button.

`NoRole`
: The button is a "No"-like button.

`ApplyRole`
: The button applies current changes.

`ResetRole`
: The button resets the dialog's fields to default values.

`image` `= FILE`
: specifies a pixmap to use on the button.

`accel` `= KEYSEQUENCE`
: sets a CTRL or ALT key sequence that activates this button. For normal ALT keyboard shortcuts, use the & notation in the title string.

  Example:

```
accel = Ctrl+U
```

`border` `= BOOL (default: Yes)`
: sets whether the buttons have a border.

`autoRepeat` `= BOOL (Default: No)`
: sets whether the button sends repeated clicked signal when user holds button.

`normalOnImage` `= FILE`

`normalOffImage` `= FILE`

`activeOnImage` `= FILE`

`activeOffImage` `= FILE`

`disabledOnImage` `= FILE`

`disabledOffImage` `= FILE`
: specifies a different images for all states of the button.

`popupMenu`
: defines a pop-up menu to show on button press.

`globalStop` `= BOOL (default: No)`
: sets whether this button can be used as a global stop button, so that current ML calculations can be stopped by clicking this button.

  To check buttons for a stop request in the scripting, you have to call `MLAB.shouldStop()` regularly in you scripting loop. This returns true if a stop button was pressed.

`command` `= SCRIPT`
: defines a script command that is executed when the button is pressed/toggled.

`fieldDragging` `= BOOL`
: sets whether the dragging of the button onto other buttons is possible to create field connections. The default is 'Yes' for normal panels and 'No' for standalone applications. This enables the field context menu on the button.

4.4.4. ToolButton

ToolButton is a quick access button which is typically used in ToolBars. It can have an additional pop-up menu that pops up after a given delay. It has mainly the features from Button, but additionally supports `autoRaise`, which lets the border be highlighted when the mouse moves over it. The title is typically not shown. It can either trigger a MLABTriggerField or MLABBoolField or can call a script given as `command` tag. The button can have multiple images for the different states and it can be a normal or a toggle button.

Dynamic scripting: MLABToolButtonControl

```
ToolButton [FIELD] {
  image                = FILE
  title                = STRING
  titleField           = FIELD
  textPosition         = ENUM           [Bottom]
  autoRepeat           = BOOL           [No]
  autoRaise            = BOOL           [No]
  autoScale            = BOOL           [No]
  accel                = KEYSEQUENCE
  scaleIconSetToMinSize = BOOL          [No]
  normalOnImage        = FILE
  normalOffImage       = FILE
  activeOnImage        = FILE
  activeOffImage       = FILE
  disabledOnImage      = FILE
  disabledOffImage     = FILE
  globalStop           = BOOL           [No]
  inlineDrawing        = BOOL           [No]

  popupMenu {
    // See definition of SubMenu
  }
  popupDelay = FLOAT (deprecated)
  popupMode = [Instant|Delayed|MenuButton]

  command    = SCRIPT
}
```

title = STRING
: sets a title string on the button (typically not shown).

titleField = FIELD
: specifies a field that provides the text for the button (text is updated when field changes).

image = FILE
: specifies a pixmap to use on the button.

textPosition = ENUM (default: Bottom)
: sets the position of the title relative to the image.

  Values: Right, Bottom

accel = KEYSEQUENCE
: sets a CTRL or ALT key sequence that activates this button. For normal ALT keyboard shortcuts, use the & notation in the title string.

  Example:

  `accel = Ctrl+U`

autoRepeat = BOOL (default: No)
: sets whether the button sends repeated clicked signal when user holds button.

autoRaise = BOOL (default: No)
: sets whether the border is shown only on mouse over.

autoScale = BOOL (default: No)
: scales the images to the MeVisLab global default tool button size.

scaleIconSetToMinSize = BOOL (default: No)
: if autoScale is set to 'Yes' and this tag is also set to 'Yes', the Images from the following six ImageTags are not scaled to the default tool button size but to the minimum size of the tool button as set by the tags mw and mh:

normalOnImage = FILE

normalOffImage = FILE

activeOnImage = FILE

activeOffImage = FILE

disabledOnImage = FILE

disabledOffImage = FILE
specifies different images for all states of the button.

popupMenu
defines a pop-up menu to show on button press.

popupDelay = FLOAT (deprecated)
Sets the delay to show the popup. This is deprecated, use popupMode instead.

popupMode = [Instant,Delayed,MenuButton]
Sets the mode of the popup. If set to Instant, the popup shows when the button is pressed. If set to Delayed, the popup shows if the button is pressed for a system dependend time span. If set the MenuButton, an extra menu button is rendered next to the normal ToolButton.

globalStop = BOOL (default: No)
defines whether this button can be used as a global stop button, so that current ML calculations can be stopped by clicking this button.

To check buttons for a stop request in the scripting, you have to call `MLAB.shouldStop()`regularly in you scripting loop. This returns true if a stop button was pressed.

inlineDrawing = BOOL (default: No)
enables inline drawing, which disables drawing of the button frame and the sunken state.

This is useful when used as an inline widget of a LineEdit.

command = SCRIPT
defines a script command that is executed when the button is pressed/toggled.

4.4.5. CommonButtonGroup

CommonButtonGroup cannot be used directly. It implements the common functionality for button groups, which are PushButtonGroup, RadioButtonGroup and ToolButtonGroup.

Button groups are GUI elements to group buttons together, because they share a common purpose. An example would be a panel where the user has to select one or more filters to be applied to an image. The buttons would be checkable and not exclusive. The button group can be synchronized with an enum field, integer field, and it can be used without any field.

```
CommonButtonGroup [FIELD] {
  border                 = BOOL                 [No]
  buttonClickedCommand   = SCRIPT
  buttonPressedCommand   = SCRIPT
  buttonReleasedCommand  = SCRIPT
  equalButtonWidths      = BOOL                 [No]
  equalButtonHeights     = BOOL                 [No]
  exclusiveButtons       = BOOL                 [No, with fields Yes]
  margin                 = UINT                 [2]
  orientation            = ENUM                 [Horizontal]
  showButtonNames        = BOOL                 [No]
  showIconsOnly          = BOOL                 [No]
  spacing                = UINT                 [4]
  stripEnumItemPrefix    = BOOL                 [Yes]
  strips                = UINT                  [1]
  title                 = TRANSLATEDSTRING

  items {
    item [NAME|VALUE] {
      command = SCRIPT

      enabled = BOOL
      visible = BOOL

      dependsOn = FIELDEXPRESSION
      visibleOn = FIELDEXPRESSION

      image     = IMAGEFILE
      shortcut  = TRANSLATEDKEYSEQUENCE
      title     = TRANSLATEDSTRING
      tooltip   = TRANSLATEDSTRING
      whatsThis = TRANSLATEDSTRING

      activeOnImage    = IMAGEFILE
      activeOffImage   = IMAGEFILE
      disabledOnImage  = IMAGEFILE
      disabledOffImage = IMAGEFILE
      normalOnImage    = IMAGEFILE
      normalOffImage   = IMAGEFILE
    }
    // ... more items may follow ...
  }
}
```

`border` `= BOOL (default: No)`
: sets whether a rectangular border is drawn around the buttons.

Note

A border is required if a title is given. Setting border to No and specifying a title will result in an error message and border will be set to Yes.

`buttonClickedCommand` `= SCRIPT`
: defines a script command that is called when any button has been clicked. The button name is passed as argument.

`buttonPressedCommand` `= SCRIPT`
: defines a script command that is called when any button has been pressed. The button name is passed as argument.

`buttonReleasedCommand` `= SCRIPT`
: defines a script command that is called when any button has been released. The button name is passed as argument.

`equalButtonWidths` `= BOOL (default: No)`
: if set to Yes, then the widths of all buttons in the group are resized to match the widest button.

`equalButtonHeights` `= BOOL (default: No)`
: if set to Yes, then the heights of all buttons in the group are resized to match the highest button.

`exclusiveButtons` `= BOOL (default: No, with field: Yes)`
: sets whether only the last clicked buttons is checked and all others are released. This is only supported if buttons are checkable.

Note

If an enum field or integer field is used, then this is always Yes, because the field can have only one state.

`margin` `= UINT (default: 2)`
: sets the margin of the button group widget. It is applied to all four sides: top, left, bottom, right.

orientation = ENUM (default: Horizontal)
    specifies if the buttons are vertically or horizontally laid out.

showButtonNames = BOOL (default: No)
    sets whether the button name is appended to the title.

showIconsOnly = BOOL (default: No)
    sets whether the button name and title are not displayed.

spacing = UINT (default: 4)
    sets the amount of space between the buttons.

stripEnumItemPrefix = BOOL (default: Yes)
    sets whether title prefixes are removed. For example, if the enum titles are "AutoUpdate" and "AutoLoad", the titles will be "Update" and "Load". "Auto_Update" and "Auto_Load" will also be "Update" and "Load". This is only evaluated if the button group is assigned to an enum field.

strips = UINT (default: 1)
    specifies how many buttons are added to a row if the orientation is horizontal, or to a column if the orientation is vertical.

title = STRING
    specifies the title of the button group. If it is not empty, border must be set to Yes, since it this required. Otherwise a warning is printed.

items
    specifies the items of an enumeration. Their values must correspond to a field value, or, if no field is given, it can be freely choosen. The value will be the button name and is used to access the buttons through the scripting API (see *Button Access Slots* in MLABCommonButtonGroupControl).

command = SCRIPT
    defines a script command that is called when the button has been clicked.

enabled, **visible** = BOOL
    sets whether the button is initially enabled/visible.

dependsOn, **visibleOn** = FIELDEXPRESSION
    determines whether the button is disabled/hidden, otherwise enabled/visible. See dependsOn/visibleOn of the generic Control for a more detailed explanation of the expression.

image = IMAGE
    sepcifies an image file to add an icon to the button.

title = STRING
    specifies the text of the button.

tooltip = STRING
    sets a text that pops up if the button receives a tooltip event. For example, this happens when the mouse cursor stays over the button.

whatsThis = STRING
    sets an additional help text.

activeOnImage, **activeOffImage**, **disabledOnImage**, **disabledOffImage**, **normalOnImage**, **normalOffImage** = IMAGEFILE
    specifies image files that are displayed as the icon of the button, depending on its modes and states.

    The button is *active* when the user is interacting with the button, for example, moving the mouse over it or clicking it.

disabled means that the functionality of the button is not available.

normal is the default mode. The user is not interacting with the button, but the functionality is available.

The *on* and *off* states correspond to the ckecked state of the button.

Dynamic scripting: MLABCommonButtonGroupControl

4.4.6. PushButtonGroup

PushButtonGroup is derived from CommonButtonGroup.

PushButtonGroup supports these additional tags:

```
PushButtonGroup [FIELD] {
  autoScaleIcons    = BOOL     [No]
  checkableButtons = BOOL     [No, with field Yes]
  flatButtons      = BOOL     [No]
  iconWidth        = INTEGER
  iconHeight       = INTEGER
  useOriginalIconSizes = BOOL [No]

  // .. more tags of CommonButtonGroup ...
}
```

`autoScaleIcons` `= BOOL (default: No)`
: sets whether the icons are scaled to the default icon size of MeVisLab.

`checkableButtons` `= BOOL (default: No, with field: Yes)`
: sets whether the buttons are checkable and are automatically raised after clicking on them.

Note

If an enum field or integer field is used, then this is always Yes, because the field has a state.

`flatButtons` `= BOOL (default: No)`
: sets whether the border of the button is not raised.

`iconWidth` `= INTEGER`
: sets the maximum width of the button icons. Requires that iconHeight is also set.

`iconHeight` `= INTEGER`
: sets the maximum height of the button icons. Requires that iconWidth is also set.

`useOriginalIconSizes` `= BOOL (default: No)`
: sets whether the original image size is used as icon size.

Dynamic scripting: MLABPushButtonGroupControl

4.4.7. RadioButtonGroup

RadioButtonGroup is derived from CommonButtonGroup.

Note

The radio buttons are always checkable and the default value for exclusiveButtons is Yes.

```
RadioButtonGroup [FIELD] {
  // .. tags of CommonButtonGroup ...
}
```

Dynamic scripting: MLABRadioButtonGroupControl

4.4.8. ToolButtonGroup

ToolButtonGroup is derived from CommonButtonGroup.

ToolButtonGroup supports these additional tags:

```
ToolButtonGroup [FIELD] {
  autoScaleIcons    = BOOL     [No]
  autoRaiseButtons  = BOOL     [Yes]
  checkableButtons  = BOOL     [No, with field Yes]
  iconWidth         = INTEGER
  iconHeight        = INTEGER
  useOriginalIconSizes = BOOL [No]

  // .. more tags of CommonButtonGroup ...
}
```

autoScaleIcons = BOOL (default: No)
: see autoScaleIcons of PushButtonGroup.

autoRaiseButtons = BOOL (default: Yes)
: sets whether tool buttons are automatically raised.

checkableButtons = BOOL (default: No, with field: Yes)
: see checkableButtons of PushButtonGroup.

iconWidth = INTEGER
: sets the maximum width of the button icons. Requires that iconHeight is also set.

iconHeight = INTEGER
: sets the maximum height of the button icons. Requires that iconWidth is also set.

useOriginalIconSizes = BOOL (default: No)
: sets whether the original image size is used as icon size.

Dynamic scripting: MLABToolButtonGroupControl

4.4.9. ButtonBar

Note

This control is deprecated. Use PushButtonGroup, RadioButtonGroup, ToolButtonGroup or ComboBox instead.

ButtonBar is a control that has different appearances for a given number of entries being read from an enum field or integer field. It can be vertically or horizontally laid out. It is synchronized with the field bidirectionally.

Available modes are:

- a group of Buttons with icons and/or titles
- a group of RadioButtons with icons and/or titles

- a ComboBox that shows a pop-up bar showing the possible options as items. Items are given as list of items in the `items` tag group. Each item either gives an enum string value or an integer number. If no items are given for an enum field, all enums are automatically shown with their titles.

Dynamic scripting: MLABButtonBarControl

Tip

If you use the radio value for the `show` mode, you can generate nice one-of-many radio groups.

```
ButtonBar FIELD {
  title             = STRING
  show              = ENUM       [All]
  enumAutoFormat    = BOOL       [Yes]
  direction         = ENUM       [Horizontal]
  border            = BOOL       [Yes]
  showItemInternals = BOOL       [No]

  strips            = INT        [1]
  autoScale         = BOOL       [No]

  items {
    item [NAME|VALUE] {
      image             = FILE
      title             = STRING
      tooltip           = STRING
      whatsThis         = STRING
      accel             = KEYSEQUENCE
      normalOnImage     = FILE
      normalOffImage    = FILE
      activeOnImage     = FILE
      activeOffImage    = FILE
      disabledOnImage   = FILE
      disabledOffImage = FILE
    }
    ...
  }
}
```

`show` `= ENUM (default: All)`
: how the ButtonBar should show its items.

  Possible values: One, All, Radio, Toolbuttons

  "one" shows the pop-up menu, "all" shows all entries as buttons, "radio" shows radio buttons and "toolbuttons" shows tool buttons.

`direction` `= ENUM (default: Horizonal)`
: defines the layout direction of the buttons.

  Possible values: Vertical, Horizontal

`border` `= BOOL (default: Yes)`
: sets whether buttons should have a border (not selectable in all show options).

`showItemInternals` `= BOOL (default: No)`
: sets whether items show their internal name.

`title` `= STRING`
: sets the title of the ButtonGroup frame if any (if used, implicitly sets border = Yes).

`strips` `= INT (default: 1)`
: sets the number of "strips" in which the buttons are organized.

`spacing` `= INT (default: 4)`
: sets the spacing between buttons (not used in all show options).

`autoScale` `= BOOL (default: No)`
: sets the scaling of the images of toolbuttons to the MeVisLab global default tool button size.

enumAutoFormat = `BOOL (default: Yes)`
sets whether the enumeration item names should be automatically formatted.

items
specifies the items shown in the ButtonBar. If not specified, uses items from enum field automatically.

Each item is specified with the `item` tag which need to have a string value for an enum field and an integer for an integer field.

Each item entry can hold the following tags:

image = `FILE`
sets the image to be used for the item.

title = `STRING`
sets the title to be used for the item. To have a toolbutton that only shows its icon, set this explicitly to an empty string.

tooltip = `STRING`
sets the tool tip shown on the item (for the pushbutton, radiobuttons).

whatsThis = `STRING`
sets an additional help text for the item (for the pushbutton, radiobuttons).

accel = `STRING`
sets an accelerator key for this item.

normalOnImage = `FILE`

normalOffImage = `FILE`

activeOnImage = `FILE`

activeOffImage = `FILE`

disabledOnImage = `FILE`

disabledOffImage = `FILE`
specifies images for the different states of the buttons (not supported in all show modes).

```
// Integer field as radio buttons
ButtonBar someIntField {
  show      = Radio
  direction = Vertical
  title     = "Select child"
  items {
    item -1 { title = "Auto"    }
    item  0 { title = "Child 0" }
    item  2 { title = "Child 2" }
    item  4 { title = "Child 4" }
  }
}
// Enum field as buttons
ButtonBar someEnumField {
  show      = All
  direction = Vertical
  items {
    item "ADD"      { image = $(LOCAL)/add.png [title= ...]}
    item "SUBTRACT" { image = $(LOCAL)/subtract.png        }
    item "BLEND"    { image = $(LOCAL)/blend.png           }
  }
}
```

4.4.10. CheckBox

CheckBox is a check box with a label or image to the right. It can be synchronized with an MLABBoolField or MLABIntegerField. If a Field is given, the label of the Checkbox also supports drag-and-drop the same way as Field-Controls.

Dynamic scripting: MLABCheckBoxControl

Tip

A CheckBox is used to implement a many-of-many choice, while a one-of-many choice is done with a RadioButtonGroup or a ComboBox.

```
CheckBox [FIELD] {
  title    = STRING
  checked  = BOOL     [No]
  image    = FILE
  editable = BOOL     [Yes]

  toggledCommand = SCRIPT
  fieldDragging  = BOOL
}
```

checked = BOOL (default: No)
: specifies the intially checkbox state.

title = STRING
: sets the label text next to the checkbox (RichText).

image = FILE
: specifies a pixmap to use next to the checkbox.

editable = BOOL (default: Yes)
: sets whether an editing is allows of the value. If set to 'No' the value is not editable, but the text is displayed normally.

(This is different from the general Control tag `enabled`, which enables or disables a whole control (also called "grayed out").)

toggledCommand = SCRIPT (argument: toggledState)
: sets a script command that is called when checkbox is checked or unchecked, passing the new state as argument.

fieldDragging = BOOL
: sets whether the dragging of the fields label onto other field label is possible to create connections. The default is 'Yes' for normal panels and 'No' for standalone applications. This also turns on the connection icons and enables the field context menu on field labels.

4.4.11. ComboBox

ComboBox is a control that allows a string to be edited and also supports a pop-up of possible values. If editing is disabled, only selecting a preset is possible. If the ComboBox has a given field, it is synchronized in both directions. The field can be an enum field or a field of any type that reacts in a meaningful way with a setStringValue/stringValue.

Dynamic scripting: MLABComboBoxControl

```
ComboBox [FIELD] {
  editable                  = BOOL      [Yes]
  validator                 = REGEXP
  autoComplete              = BOOL      [Yes]
  caseSensitiveAutoComplete = BOOL      [Yes]
  enumAutoFormat            = BOOL      [Yes]
  acceptWheelEvents         = BOOL      [Yes]
  maxCount                  = INT
  insertPolicy              = ENUM      [AtBottom]
  duplicatesEnabled          = BOOL      [Yes]
  comboField                 = FIELD
  comboSeparator             = STRING    [,]
  activatedCommand           = SCRIPT
  textChangedCommand         = SCRIPT

  items {
    item {
      image = FILE
      title = STRING
    }
    ...
  }
}
```

editable = BOOL (default: Yes)
: sets whether the comboxbox string is editable.

validator = REGEXP
: Sets a regular expression to check the if the input line is valid when the combobox is editable. A description of the regular expression syntax can be found here: http://doc.qt.io/qt-5/qregexp.html

Note: Items from the drop-down box should match the regular expression.

autoComplete = BOOL (default: Yes)
: sets whether the combobox auto completes when editable.

caseSensitiveAutoComplete = BOOL (default: Yes)
: sets whether the combobox auto completion is case sensitive.

enumAutoFormat = BOOL (default: Yes)
: sets whether enum fields should avoid automatic formatting of enumeration names. Automatic formatting means that a field called "MyName" receives the automatic title "My Name". If the enum items have a common prefix, this is also stripped when automatic formatting is active.

acceptWheelEvents = BOOL (default: Yes)
: sets whether the ComboBox should accept mouse wheel events to adjust its value.

textChangedCommand = SCRIPT(argument: string)
: defines a script command that is executed when the text in the combo box changes (every time the user types something).

activatedCommand = SCRIPT (argument: string)
: defines a script command that is executed when a combobox item is selected or entered by typing and pressing return.

maxCount = INT
: sets the maximum number of items.

insertPolicy = ENUM (default: AtBottom)
: defines where new items are inserted when combo box is editable.

Possible values: NoInsertion, AtTop, AtCurrent, AtBottom, AfterCurrent, BeforeCurrent

duplicatesEnabled = BOOL (default: Yes)
: sets whether duplicate items are allowed to be entered when editable (does not apply to script methods that insert items).

comboField = FIELD
: specifies a field whose string value is split and used instead of given items.

When the comboField changes, the available combo list is updated.

comboSeparator = STRING (default:",")
: sets a string value to use for splitting the string value of `comboField` into individual values.

items
specifies the items shown in the ComboBox. May be omitted if `comboField` is given.

Each item is specified with the `item` tag.

Each item entry can hold the following tags:

image = FILE
defines an image to be used for the item

title = STRING
defines a title string to be used for the item

Example 4.10. ComboBox

Have a look at the module **TestComboBox**. This module features a ComboBox and some scripting for adding new items dynamically, as well as clearing all items by scripting. The module also features the use of icons in a ComboBox.

Because the major portion of this example module is implemented in scripting, the code is not printed here.

4.4.12. MenuBar

MenuBar is a control that shows a menu bar with a number of pop-up menus. It can contain n SubMenu entries. See SubMenu for details on the menu definition.

Typically a MenuBar should only be used on the top of a window, but there is no layout restriction on that.

Dynamic scripting: MLABMenuBarControl

```
MenuBar {
  SubMenu NAME {
    ...
  }
  // more SubMenus ...
}
```

Example 4.11. MenuBar

Have a look at the module **TestPopupMenu**. This module shows how to setup various menues on a module's GUI. The first menu created on that module uses a MenuBar with only one entry.

4.4.13. ColorEdit

ColorEdit shows a colored box and allows to edit an RGB color. If the user double-clicks on the colored box, a ColorDialog pops up and you can pick a color. The given field has to be of type MLABColorField. The field is synchronized with the ColorEdit in both directions.

Dynamic scripting: MLABColorEditControl

Tip

You can also drag colors between color edits.

```
ColorEdit FIELD {
  mode = ENUM    [Box]
}
```

mode = ENUM (default: Box)
: defines the type of editor. Possible values are box and triangle, where box just shows a colored box and triangle shows a HSV color triangle for in-place editing.

Example 4.12. ColorEdit

Have a look at the module **TestVerticalLayout**. This module features, amongst others, the use of a ColorEdit.

4.4.14. LineEdit

LineEdit shows a single line with an editable string. Typically it can be edited. If you want a non-editable text, use Label instead. LineEdit typically is synchronized bidirectionally with a given field, but it can also be used in scripting only.

Dynamic scripting: MLABLineEditControl

```
LineEdit [FIELD] {
  value                   = STRING
  textAlignment           = ENUM       [Left]
  minLength               = INT        [10]
  maxLength               = INT
  hintText                = STRING
  trim                    = ENUM       [None]
  editMode                = ENUM       [Normal]
  returnPressedCommand    = SCRIPT
  textChangedCommand      = SCRIPT
  lostFocusCommand        = SCRIPT
  validator               = REGEXP
  updateFieldWhileEditing = BOOL       [No]

  inlineWidgetsMargin      = UINT       [2]
  inlineWidgetsSpacing     = UINT       [2]
  leftInlineWidgets {
    // MDL Controls
  ...
  }
  rightInlineWidgets {
    // MDL Controls
  ...
  }

}
```

value = STRING
: sets the value of the line edit if FIELD is omitted.

minLength = INT (default: 10)
: sets the minimum number of characters that should be visible in the LineEdit.

maxLength = INT
: sets the maximum allowed length of text.

hintText = STRING
: defines a text shown in editable line edit if line edit is empty and does not have the focus.

updateFieldWhileEditing = BOOL (default: No)
: sets whether the attached field is updated while the user types text in the line edit.

textAlignment = ENUM (default: Left)
: defines how the text is aligned.

  Possible values: Auto, Left, Right, Center

editMode = ENUM (default: Normal)
: defines the mode, can be set for use for password editing.

Possible values: Normal, Password

`trim` `= ENUM (default: None)`
defines the trimming mode of the string when it is not edited. Trimming only works if there is an attached field.

Possible values: Left, Center, Right, None

Left: "...LongText"

Center: "Long...Text"

Right : "LongText..."

None: No trimming

`returnPressedCommand` `= SCRIPT`
defines a script command that is called when RETURN is pressed.

`textChangedCommand` `= SCRIPT`
defines a script command that is called when the text has changed (including pressing RETURN).

`lostFocusCommand` `= SCRIPT`
defines a script command that is called when the focus is lost. Use the `isModified` method to check if the text was edited by the user

`validator` `= REGEXP`
specifies a regular expression to test if the entries are valid. A description of the regular expression syntax can be found here: http://doc.qt.io/qt-5/qregexp.html

`inlineWidgetsMargin` `= UINT`
specifies the margin of the inline widgets.

`inlineWidgetsSpacing` `= UINT`
specifies the spacing of the inline widgets.

`leftInlineWidgets`
specifies the MDL controls to be used as inline widgets on the inner left of the line edit.

A typical control to use is a ToolButton with inlineDrawing set to true.

`rightInlineWidgets`
see leftInlineWidgets (but for the right side of the line edit)

Example 4.13. LineEdit

Have a look at the module **TestVerticalLayout**. This module features, amongst others, the use of a LineEdit.

4.4.15. NumberEdit

NumberEdit shows a edit box for integers, floats and doubles. It also has a step up/step down button (if a step value is given). A field has to be given to which the NumberEdit is synchronized bidirectionally. If the field has a min/max value, the edited value is automatically clamped to these values. If no format is given, floating point precision is 3.

Dynamic scripting: MLABNumberControl

```
NumberEdit FIELD {
  step              = FLOAT
  stepstep          = FLOAT
  showStepButtons   = BOOL
  format            = FORMATSTRING
  minLength         = INT            [5]
  editAlign         = ENUM           [Right]
  wrap              = BOOL           [No]
  acceptWheelEvents = BOOL           [Yes]
}
```

`step` `= FLOAT`
defines a step value for step buttons.

`stepstep` `= FLOAT`
defines an extra step value for stepping smaller steps.

`showStepButtons` `= BOOL`
sets whether step buttons are shown (only applicable if step is not 0).

`format` `= STRING`
defines a format to be printed as in sprintf, e.g., %4.5f or %x .

Note

You have to use the correct %d,%x ,%f,%g type for float/double/int fields

`minLength` `= INT (default: 5)`
sets the minimum number of characters that should be visible in the LineEdit.

`editAlign` `= ENUM (default: Right)`
defines the alignment of the text in the Line/NumberEdits.

Possible values: Left, Right, Center

`wrap` `= BOOL`
if FIELD has min/max value, this option sets whether step and stepstep wrap the value around when reaching the boundaries.

`acceptWheelEvents` `= BOOL (default: Yes)`
sets whether the NumberEdit should accept mouse wheel events to adjust its value.

Example 4.14. NumberEdit

Have a look at the module **TestHorizontalLayout**. This module features, amongst others, the use of a NumberEdit.

4.4.16. VectorEdit

VectorEdit allows showing/editing of a Vec2f/3f/4f/Color/Plane/Rotation field. It has n labels and number edits depending on the type of the field. The VectorEdit is synchronized in both directions. Typical layout: x | NumberEdit | y | NumberEdit | z | NumberEdit | d | NumberEdit | [Apply Button]

The Apply button is only needed for the Rotation field, because the rotation vector is always normalized immediately. The Apply button can be enabled for other fields if needed.

Dynamic scripting: MLABVectorControl

```
VectorEdit {
  edit               = BOOL       [Yes]
  format             = STRING
  minLength          = INT        [3]
  editAlign           = ENUM       [Right]
  applyButton         = BOOL
  sunkenVectorLabels  = BOOL       [Yes]
  componentTitles     = STRING
  spacing             = INT        [0]
}
```

`edit` `= BOOL (default: YES)`
: sets whether Labels are used instead of NumberEdits.

`format` `= STRING`
: defines the format to be printed as in sprintf, e.g., %4.5f or %x .

Note

You have to use the correct %d,%x ,%f,%g type for float/double/int fields.

`minLength` `= INT (default: 3)`
: sets the minimum number of characters that should be visible in the NumberEdits.

`editAlign` `= ENUM (default: Right)`
: defines the alignment of the text in the NumberEdits.

Possible values: Left, Right, Center

`applyButton` `= BOOL`
: sets whether the field has an Applybutton. It is enabled for Rotation fields, otherwise the default is disabled. If turned on, you can edit all fields of a vector and apply it afterwards at once by pressing "Apply".

`sunkenVectorLabels` `= BOOL (default: Yes)`
: sets whether labels are drawn into the same frame as the LineEdit, otherwise they are drawn separately.

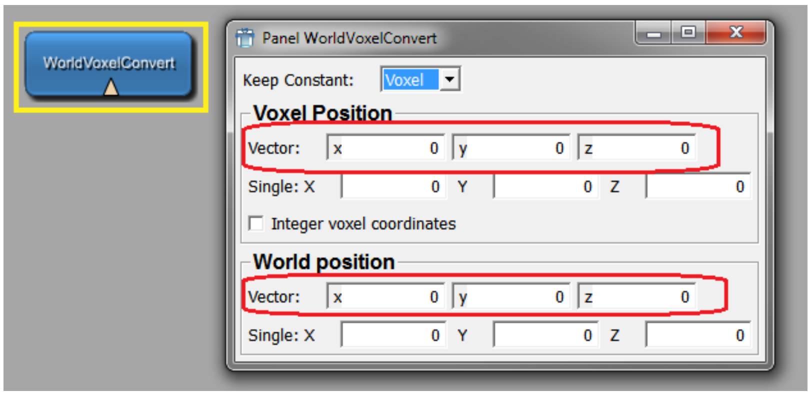
`componentTitles` `= STRING`
: specify titles for the separate component edit boxes, overriding the default values. Values must be comma-separated. Extra values will be ignored, if too few values are specified the remaining labels will be unchanged.

`spacing` `= INT (default: 0)`
: sets the internal spacing between the GUI elements of a VectorEdit.

Example 4.15. VectorEdit

Have a look at the module **DRR**. This module uses two VectorEdit controls in a Grid layout.

Figure 4.10. VectorEdit Example



Keep Constant: Voxel

Voxel Position

Vector: x 0 y 0 z 0

Single: X 0 Y 0 Z 0

Integer voxel coordinates

World position

Vector: x 0 y 0 z 0

Single: X 0 Y 0 Z 0

4.4.17. DateTime

DateTime allows to display and edit a date, a time or a combined date/time value. These date/time values must be provided as a string in a field and can have one of a few formats.

Please note that the display of the values happens with the currently selected locale and may change with your language settings.

```
DateTime FIELD {
  mode               = ENUM     [DateTime]
  format             = ENUM     [Dicom]
  editable           = BOOL     [Yes]
  enableCalenderPopup = BOOL     [Yes]
  withMilliSeconds    = BOOL     [5]
}
```

mode = ENUM (default: DateTime)
defines if the values are just date, just time or both date and time.

Possible values: Date, Time, DateTime

format = ENUM (default: Dicom)
defines the string format of the values, to interpret/format the values in the associated field.

ISO means ISO 8601, Dicom is the date/time value format of the DICOM standard and ML is a modification of ISO with a space instead of the middle 'T'.

Possible values: ISO, Dicom, ML

editable = BOOL (default: Yes)
defines if the date/time should be editable. If a field is associated with this control, this value defaults to the editable state of the field.

enableCalenderPopup = BOOL (default: Yes)
defines if the date should offer a calender popup. The calender popup currently does not work if the control is used in a GraphicsView, so it should be disabled in this case.

withMilliSeconds = BOOL (default: No)
defines if time should be displayed with milliseconds. This might be useful for Dicom values, which come with microsecond precision.

Example 4.16. DateTime

Have a look at the module **TestDateTime**. This module lists different configurations of the DateTime control.

4.4.18. Slider

Slider shows a slider control for integers, floats and doubles. It can be arranged vertically or horizontally. A field has to be given to which the Slider is synchronized bidirectionally. Min/max values are taken from the field and will be adjusted automatically when the field's min/max value changes.

Dynamic scripting: MLABSliderControl

```
Slider FIELD {
  pageStep     = FLOAT
  snap         = FLOAT
  autoPageStep = FLOAT
  direction    = ENUM            [Horizontal]
  format       = FORMATSTRING
  tickmarks    = BOOL            [No]
  tracking     = BOOL            [Yes]

  pressedIndicatorField = FIELD
}
```

pageStep = FLOAT
sets a step value that is used when the user clicks left or right of the slider.

snap = FLOAT
sets a snap value for the slider. If set to a value != 0, the slider always snaps to a value that is a multiple of this value starting at the sliders minimum.

pressedIndicatorField = FIELD
specifies a Boolean field that is set to true if the user presses the slider button and to false if the user releases the slider button.

autoPageStep = FLOAT
sets a step value as percentage 0..1 of min/max value, overwrites `pageStep`.

direction = ENUM (default: Horizontal)
defines the layout direction of the slider.

Possible values: Vertical, Horizontal

format = FORMATSTRING
specifies how the value of the slider is shown in the tool tip, in sprintf format. Set this to a string containing only one space to suppress the tool tip completely.

tickmarks = BOOL (default: No)
sets whether tick marks are enabled.

tracking = BOOL (default: Yes)
sets whether the slider updates the field while the slider is being dragged.

Example 4.17. Slider

Have a look at the module **TestHorizontalLayout**. This module shows the use of various controls for a float number.

4.4.19. IntervalSlider

IntervalSlider shows a double slider control for integers, floats and doubles. It can be arranged vertically or horizontally. A widthField and centerField pair or a lowerField and upperField pair has to be given to which the Slider is synchronized bidirectionally. Min/Max values are taken from the lower/upper fields or from the center field and will be automatically adjusted when field's min/max value changes.

When width/center is given, the slider acts in window/level mode so that the window can be of (max/min) size. When lower/upper is given, it allows choosing lower and upper values and is bound strictly to min/max values.

Dynamic scripting: MLABIntervalSliderControl

Tip

Only width/center or lower/upper field pairs can be given, NOT both!

```
IntervalSlider {
  step        = FLOAT
  snap        = FLOAT
  direction   = ENUM          [Horizontal]
  tracking    = BOOL          [Yes]
  centerField = FIELD
  widthField  = FIELD
  upperField  = FIELD
  lowerField  = FIELD

  pressedIndicatorField = FIELD
}
```

step = FLOAT
: sets a step value that is used when the user clicks left or right of the slider.

snap = FLOAT
: sets a snap value. If set to a value != 0, the slider always snaps to a value that is a multiple of this value starting at the sliders minimum.

pressedIndicatorField = FIELD
: specifies a Boolean field that is set to true if the user presses the slider button and to false if the user releases the slider button.

direction = ENUM (default: Horizontal)
: lspecifies the ayout direction of slider.

  Possible values: Vertical, Horizontal

tracking = BOOL (default: Yes)
: sets whether the slider updates the field while the slider is being dragged.

centerField = FIELD
: specifies the center (alias level) field of the interval (min and max values are also taken from this field).

widthField = FIELD
: specifies the width (alias window) field of the interval.

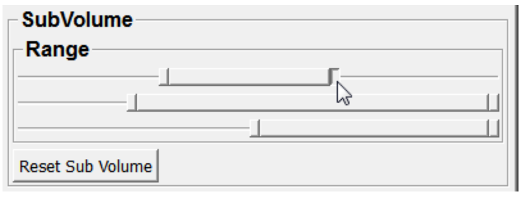
lowerField = FIELD
: specifies the lower field of the interval (min value is also taken from this field).

upperField = FIELD
: specifies the upper field of the interval (max value is also taken from this field).

Example 4.18. IntervalSlider

Have a look at the module **View3D**. If the window 'View3D' (the default window) is opened, IntervalSliders are used on the 'Clipping' tab for adjusting the size of a subimage.

Figure 4.11. IntervalSlider Example



4.4.20. ThumbWheel

ThumbWheel shows a wheel that can be turned. When the wheel is turned, it changes the associated Field which can be an Integer, Float, Double or Rotation field. The ThumbWheel adapts to the given min and max value of a field automatically. For Rotation fields (which have not min/max value), it automatically takes 0-359 degrees as min/max values. This can also be used for Float and Double fields by setting rotationMode to Yes. Otherwise the field's min/max values are used.

Dynamic scripting: MLABThumbWheelControl

```
ThumbWheel FIELD {
  snap         = FLOAT
  tracking     = BOOL         [Yes]
  wrapsAround  = BOOL         [No]
  direction    = ENUM         [Horizontal]
  ratio        = FLOAT        [1]
  rotationMode = BOOL         [No]

  pressedIndicatorField = FIELD
}
```

snap = FLOAT
: sets the snap value. The value of the wheel always snaps to a multiple of the snap value. If not set, an automatic value is calculated.

tracking = BOOL (default: Yes)
: sets whether the wheel updates the field while being dragged

pressedIndicatorField = FIELD
: specifies a Boolean field that is set to true if the user presses the slider button and to false if the user releases the slider button.

direction = ENUM (default: Horizontal)
: defines the layout direction of slider.

  Possible values: Vertical, Horizontal

ratio = FLOAT (default: 1)
: defines the ratio between turning the wheel one whole turn and the min/max range.

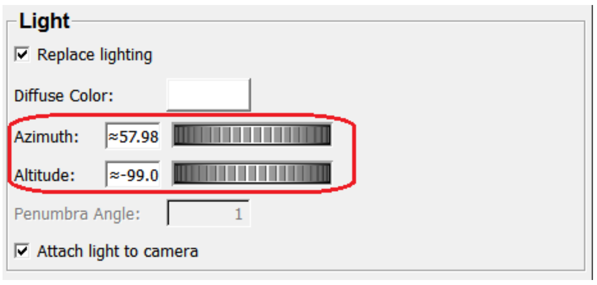
wrapsAround = BOOL (default: No)
: sets whether the slider wraps around when min/max is reached.

rotationMode = BOOL (default: No)
: sets whether the field's min/max values are set to 0/359 degrees (in radian), to allow for an easy setup for rotations.

Example 4.19. ThumbWheel

Have a look at the module **DRR**. There, ThumbWheels are used for adjusting the beam path rotation around the z- and x-axis.

Figure 4.12. ThumbWheel Example



Light

☑ Replace lighting

Diffuse Color:

Azimuth: ≈57.98

Altitude: ≈-99.0

Penumbra Angle: 1

☑ Attach light to camera

4.4.21. TextView

TextView shows a text (which may be simple text or RichText). It can be editable or just a display, and is scrollable. It typically shows a title and an Apply button. If a field is given, the fields string value is shown. If a field is given, it is synchronized bidirectionally. Typically the user has to press the "Apply" button to set the text to the field. If autoApply is on, each change to the text changes the field's string value. The "Apply" button is only visible if `edit` is set to 'Yes'.

Dynamic scripting: MLABTextViewControl

```
TextView [FIELD] {
  title        = STRING
  text         = STRING
  edit         = BOOL         [Yes]
  autoApply    = BOOL         [No]
  hscroller    = ENUM         [Auto]
  vscroller    = ENUM         [Auto]
  textFormat   = ENUM         [Auto]
  console      = BOOL         [No]
  tabStopWidth = INT          [80]
  wrap         = ENUM         [Widget]
  wrapColumn   = INT          [80]

  visibleRows        = INT
  showLineNumbers    = BOOL   [No]
  syntaxHighlighting = STRING
  fieldDragging      = BOOL
}
```

`title` `= STRING`
: sets a string to show as title (otherwise the title is the name of the field).

`text` `= STRING`
: sets a string to show if no field is given.

`edit` `= BOOL (default: Yes)`
: sets whether the text field is editable. Otherwise it is a display only.

`autoApply` `= BOOL (default: No)`
: sets whether the entered value is applied to the field whenever it changes.

`textFormat` `= ENUM (default: Auto)`
: defines the format of the text. The default is 'Auto' which searches the first text line for <> tags and switches between Rich and Plain. In Rich mode you can use HTML-like syntax for the text.

  Possible values: Auto, Rich, Plain

`hscroller` `= ENUM (default: Auto)`**`vscroller`** `= ENUM (default: Auto)`
: defines when a vertical/horizontal scrollbar is shown.

  Possible values: Auto, On, Off

`console` `= BOOL (Default: No)`
: sets whether to scroll to the end of the buffer on each append. Otherwise, it is scrolled to the new field value.

`tabStopWidth` `= INT (Default: 80 pixels)`
: sets the width of a tab stop in pixels.

`wrap` `= ENUM (Default: Widget)`
: defines the wrap mode of the TextView. The default "Widget" wraps at word boundaries inside the visible portion of the widget. "Off" switches off wrapping, "Column" wraps at a column specified by wrapColumn.

  Possible values: Widget, Column, Off

`wrapColumn` `= INT (Default: 80)`
: sets the column where to wrap words if wrap is set to "Column".

visibleRows = INT
: sets the preferred size of the TextView to hold n visible rows.

showLineNumbers = BOOL (default: No)
: sets whether line numbers are shown. Only filled lines are numbered if enabled. Numbering starts with 1.

syntaxHighlighting = STRING
: activates syntax highlighting for the specified language.

  Possible values: MDL, Python, GLSL, JavaScript

fieldDragging = BOOL
: sets whether the dragging of the fields label onto other field label is possible to create connections. The default is 'Yes' for normal panels and 'No' for standalone applications. This also turns on the connection icons and enables the field context menu on field labels.

4.4.22. HyperText

HyperText shows a RichText which can be any size and which is scrollable when bigger than the available space. In contrast to TextView, the text is always read-only. The text can contain hyper links of various kinds. The shown text can be specified directly in the text tag, from a text file or from a field. If a field is used, the text is updated whenever the field changes.

Dynamic scripting: MLABHyperTextControl

Example of hyper links:

- `<a href="http://www.mevis.de">Mevis Home Page</a>`
- `<a href="mailto:MeVisLab@mevis.de">MeVisLab Mail</a>`
- `<a href="#someanchor">Link inside this document</a>`
- `<a name="someanchor">Link anchor inside this document</a>`
- `<a href="usercmd:somecommand">A call to the command script with "somecommand" as argument</a>`
- `<a href="whatsthis:Some RichText">A link that shows a WhatsThis bubble that contains RichText</a>`

  For details, see the example module **TestHyperText**.

HyperText is derived from Frame.

```
HyperText {
  text      = RICHTEXT
  textField = FIELD
  textFile  = FILE
  command   = SCRIPT

  // Additional: tags from Frame
}
```

text = RICHTEXT
: sets the text that is shown. If you want to reference local files or images, use the $(LOCAL)/ variable to address these.

textField = FIELD
: specifies a field that provides the text. The text is updated whenever the field changes.

`textFile` `= FILE`
: specifies a file that provides the text. Local links in the text are resolved local to that file, so you can link to other documents and images.

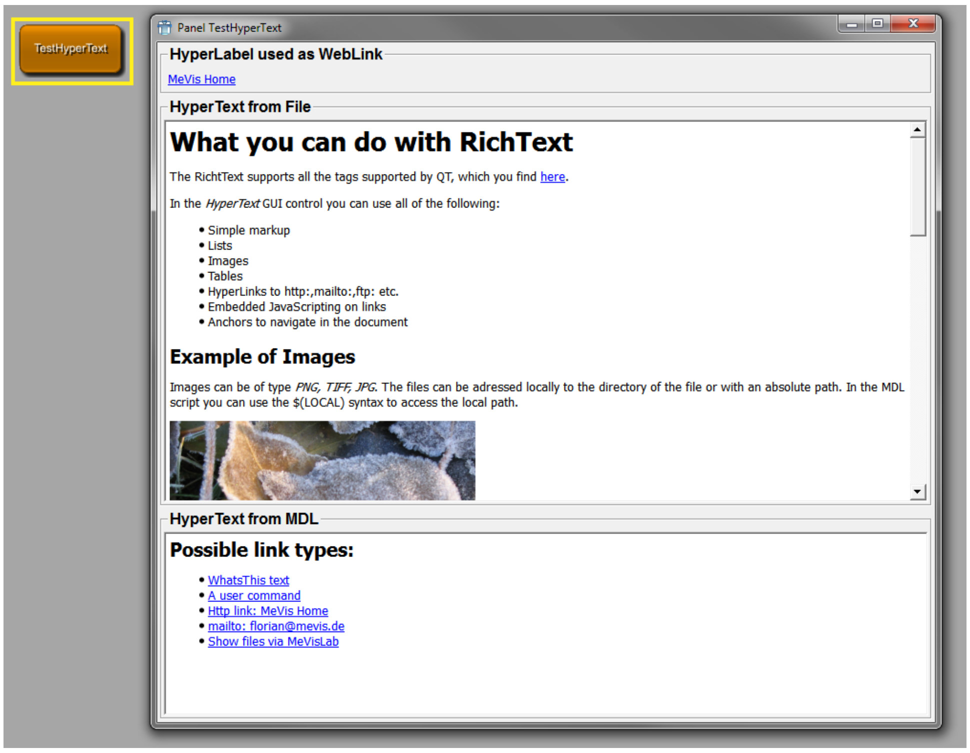
`command` `= SCRIPT (arg: string)`
: defines a script command that is called for each "usercmd:" hyper link when the link is clicked. The string after the "usercmd:" is passed to the command.

  This tag allows to create dynamic scripts that are executed when a link is clicked. All clicks are mapped to the given command, in which you can do different things depending on the argument after the "usercmd:"

Example 4.20. HyperText

Have a look at the module **TestHyperText**. This module features a HyperText and documents some of the available options.

Figure 4.13. TestHyperText Module



HyperLabel used as WebLink

MeVis Home

HyperText from File

What you can do with RichText

The RichtText supports all the tags supported by QT, which you find here.

In the *HyperText* GUI control you can use all of the following:

- Simple markup
- Lists
- Images
- Tables
- HyperLinks to http:,mailto:,ftp: etc.
- Embedded JavaScripting on links
- Anchors to navigate in the document

Example of Images

Images can be of type *PNG, TIFF, JPG*. The files can be adressed locally to the directory of the file or with an absolute path. In the MDL script you can use the $(LOCAL) syntax to access the local path.

HyperText from MDL

Possible link types:

- WhatsThis text
- A user command
- Http link: MeVis Home
- mailto: florian@mevis.de
- Show files via MeVisLab

4.4.23. HyperLabel

HyperLabel is identical to HyperText in its features, but shows the text as a label. Therefore it is not scrollable and automatically gets as big as the contained text. It behaves like a normal label but has the features of dynamic scripted links. Another advantage over a normal label is that the text can be selected and copied. For details see the HyperText control above. Note that title, titleField and titleFile are aliases for text, textField and textFile of HyperText. If the displayed text should be arranged in one line, it has to be enclosed in "<nobr></nobr>".

HyperLabel is derived from Frame.

Dynamic scripting: MLABHyperLabelControl

```
HyperLabel {
  title      = RICHTEXT
  titleField = FIELD
  titleFile  = FILE
  command    = SCRIPT

  // Additional: tags from Frame
}
```

`title` `= RICHTEXT`
: sets the text that is shown. If you want to reference local files or images, use the $(LOCAL)/ variable to address these.

`titleField` `= FIELD`
: specifies a field that provides the text. The text is updated whenever the field changes.

`titleFile` `= FILE`
: specifies a file to provide the text. Local links in the text are resolved local to that file, so you can link to other documents and images.

Example 4.21. HyperLabel

Have a look at the module **TestHyperText**. This module features a HyperLabel at the very top of its GUI.

4.4.24. ListBox

ListBox shows a list of single line items. The list can be set by scripting or from fields providing the items via splitting the string. The ListBox takes the string value of the `values` tag or of the given field and creates items out of these strings. If a field is given, the list box is updated on the field's string value changes. Scripting methods can be found in the MeVisLab Scripting reference.

Dynamic scripting: MLABListBoxControl

```
ListBox [FIELD] {
  values                  = STRING
  visibleRows             = INT
  selectionMode           = ENUM        [Single]
  rowSeparator            = STRING      [@]

  selectionChangedCommand = SCRIPT
  selectedCommand         = SCRIPT
  currentChangedCommand   = SCRIPT
  doubleClickedCommand    = SCRIPT
  returnPressedCommand    = SCRIPT
  contextMenuOnEmptyList  = BOOL        [Yes]

  contextMenu {
    // See definition of SubMenu
  }
}
```

`values` `= STRING`
: sets a string that is used for the values instead of the FIELD.

`rowSeparator` `= STRING (default "@")`
: sets a separator string used for columns.

`visibleRows` `= INT`
: sets a minimum height to show at least number of visible rows.

`selectionMode` `= ENUM (default: Single)`
: defines if selection is possible and if multiple items can be selected at a time.

  Possible values: Single, Extended, Multi, NoSelection

  Single: Only a single item can be selected at any time.

Extended: When the user selects an item in the usual way, the selection is cleared and the new item selected. However, if the user presses the Ctrl key when clicking on an item, the clicked item gets toggled and all other items are left untouched. If the user presses the Shift key while clicking on an item, all items between the current item and the clicked item are selected or unselected, depending on the state of the clicked item. Multiple items can be selected by dragging the mouse over them.

Multi: When the user selects an item in the usual way, the selection status of that item is toggled and the other items are left alone. Multiple items can be toggled by dragging the mouse over them.

NoSelection: No item can be selected.

`contextMenu`
defines a context menu to show on right-click the list. See SubMenu on how to define a menu.

`contextMenuOnEmptyList` `= BOOL (default: Yes)`
sets whether the context menu should be shown on an empty list.

`selectionChangedCommand` `= SCRIPT`
defines a script command that is called when the selection has changed.

`selectedCommand` `= SCRIPT (argument: index)`
defines a script command that is called when an item is selected (return is pressed or double-click the item).

`currentChangedCommand` `= SCRIPT (argument: index)`
defines a script command that is called when the current item has changed.

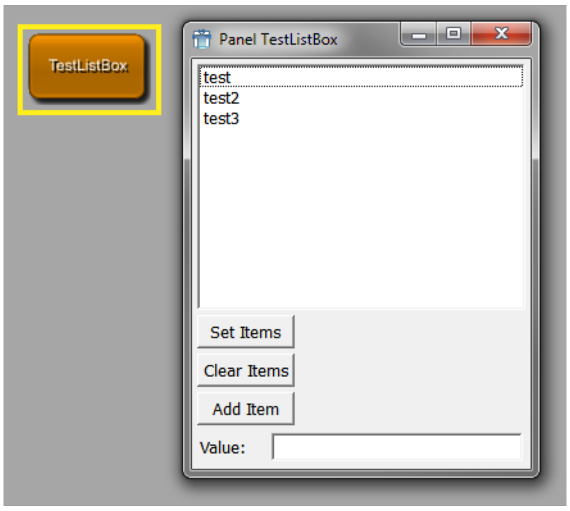
`doubleClickedCommand` `= SCRIPT (argument: index)`
defines a script command that is called when an item is double-clicked.

`returnPressedCommand` `= SCRIPT (argument: index)`
defines a script command that is called when return is pressed on an item.

Example 4.22. ListBox

Have a look at the module **TestListBox**. This module features a dynamic setting and clearing of items, and it shows how to display items with icons.

Figure 4.14. TestListBox Module



4.4.25. ListView

ListView shows a list containing strings in rows/columns. The list can be set by scripting or from fields providing the items via splitting the string. The ListView takes the string value of the `values` tag or of the given field and creates items out of these strings. If a field is given, updates everything (even number of columns) from the field's string value changes. The first row in the string is taken as Header titles if headerTitles is not specified, further rows can contain less columns. The header titles have to be present even if the header visibility is turned off.

Limitations: Currently CheckBox items cannot contain RichText (see `richText` tag).

Dynamic scripting: MLABListViewControl and MLABListViewItem

```
ListView [FIELD] {
  values          = STRING
  headerTitles    = STRING
  rowSeparator    = STRING              [\n]
  columnSeparator = STRING              [@]
  layout          = STRING
  visibleRows     = INT
  cellSpacing     = INT
  selectionMode   = ENUM                [Single]
  tabDirection    = ENUM                [Vertical]
  sortByColumn    = INT                 [-1]
  sortAscending   = BOOL                [Yes]
  header          = BOOL                [Yes]

  // advanced:
  richText        = BOOL                [No]
  toggleField     = FIELD
  checkList       = BOOL                [No]
  updateDelay     = UINT                [0]

  rootIsDecorated = BOOL                [No]

  contextMenuOnEmptyList = BOOL         [Yes]

  contextMenu {
    // See definition of SubMenu
  }

  // scripting:
  selectionChangedCommand = SCRIPT
  currentChangedCommand   = SCRIPT
  doubleClickedCommand    = SCRIPT
  returnPressedCommand    = SCRIPT
  clickedCommand          = SCRIPT

  // advanced scripting
  itemRenamedCommand          = SCRIPT
  itemCollapsedCommand        = SCRIPT
  itemExpandedCommand         = SCRIPT
  checkListItemChangedCommand = SCRIPT
  prepareEditCommand          = SCRIPT
  contextMenuRequestedCommand = SCRIPT
}
```

`values` `= STRING`
sets a string that is used for the values instead of the FIELD.

`headerTitles` `= STRING`
A string that is used for the header titles instead of the first row item of values or the content of FIELD. The same columnSeparator is used.

`rowSeparator` `= STRING (default "\n")`
sets a separator string that is used for rows.

`columnSeparator` `= STRING (default "@")`
sets a separator string that is used for columns.

`layout` `= STRING`
sets a string that defines the layout of the columns "rlcet, rlcet, ..." (right left center edit toggle).

`rlc` - results in different alignment (right, left, center).

`e` - column is editable.

`t` - one of the columns may have the "t" toggle flag which means that a CheckBoxListItem is used and the toggleField updates checkbox states.

`visibleRows` `= INT`
specifies a minimum size to fit number of visible rows (+ header) into the ListView.

`cellSpacing` `= INT`
sets an extra spacing value to all items.

`selectionMode` `= ENUM (default: Single)`
defines if selection is possible and if multiple items can be selected at a time.

Possible values: Single, Extended, Multi, NoSelection

See selectionMode for details.

`tabDirection` `= ENUM (default: Vertical)`
defines the direction when jumping to the next editable field through the use of the Tab key. When Horizontal is selected, the cursor automatically switches to the next row when reaching the table border.

Possible values: Vertical, Horizontal

`sortByColumn` `= INT (default: -1)`
sets the column number which is to sort by (default -1 means no sorting).

`sortAscending` `= BOOL (default: Yes)`
sets whether the sorting should be in an ascending order.

`header` `= BOOL (default: Yes)`
selects whether the header row is visible. If set to 'No', the header is not shown, while the titles still have to be provided via headerTitles, values or FIELD.

`richText` `= BOOL (Default: No)`
sets whether the items in the list are used as RichText, allowing to change font type, size, colors, etc.

See Section 4.9.2, “RichText” for details on RichText.

`toggleField` `= FIELD`
specifies a field to set the toggle state encoded in 0/1 chars (field is updated/updates in both directions).

`checkList` `= BOOL (default: No)`
sets whether the ListView uses CheckListItems. Normally this flag is not used; the ListView is a ToggleList if a toggleField is specified.

`updateDelay` `= UINT (default: 0)`
sets the delay in milliseconds of the ListView update when the given FIELD is changed. If set to zero the update is immediate. This flag can be useful when the ListView is updated very often due to user interaction since it is slow to update. If you set, e.g., a value of 100, the ListView will only update 10 times a second.

`rootIsDecorated` `= BOOL (default: No)`
sets whether icons are shown if a node (item) is collapsed or expanded.

`contextMenu`
defines a context menu to show on right-click the list. See SubMenu on how to define a menu.

`contextMenuOnEmptyList` `= BOOL (default: Yes)`
: sets whether the user's contextMenu is shown if the list has no entries.

`selectionChangedCommand` `= SCRIPT`
: defines a script command that is called when the selection has changed. If you want to get the selected item, call `selectedItem()` on the ListView.

`currentChangedCommand` `= SCRIPT (argument: item)`
: defines a script command that is called when the current item has changed.

`doubleClickedCommand` `= SCRIPT (argument: item, column)`
: defines a script command that is called when an item is double-clicked, column is the index of the column where the double click happened.

`returnPressedCommand` `= SCRIPT (argument: item)`
: defines a script command that is called when an item is renamed.

`clickedCommand` `= SCRIPT (arguments: item, column)`
: defines a script command that is called when an item is clicked (press+release of mouse button), column gives into which column the user clicked.

`mouseButtonClickedCommand` `= SCRIPT(arguments: button, item, position, column)`
: this command is like clickedCommand, but provides more information. "button" is a number: 1 is the left mouse button, 2 is the right mouse button and 4 the middle mouse button. "position" indicates the click position inside the clicked cell.

Note

With the switch to Qt5 this isn't called for the right mouse button anymore; if you used this to open a context menu for the current item you should use contextMenuRequestedCommand instead.

`itemRenamedCommand` `= SCRIPT (argument: item, column, newvalue)`
: defines a script command that is called when an item is renamed.

`itemCollapsedCommand` `= SCRIPT (argument: item)`
: defines a script command that is called when an item with children is collapsed.

`itemExpandedCommand` `= SCRIPT (argument: item)`
: defines a script command that is called when an item with children is expanded.

`checkListItemChangedCommand` `= SCRIPT (argument: item, column)`
: defines a script command that is called when a check list item is toggled. The column parameter is important if you have created check boxes on other columns than the first with item.setCheckBoxOn().

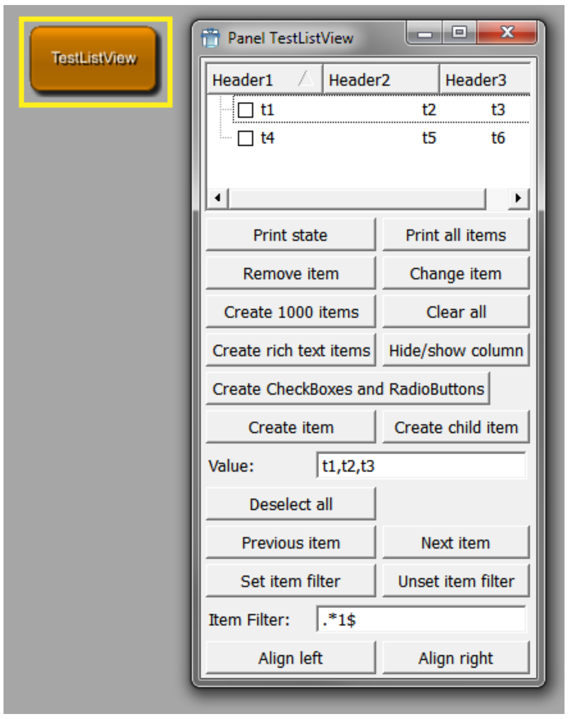
`prepareEditCommand` `= SCRIPT (argument: item, column)`
: defines a script command that is called when a cell in the list view is about to be edited. This is mainly intended for use with the method setStringEditorValues() on the list view control which allows to provide a combo box instead of a simple line edit widget for editing of cells with string content.

`contextMenuRequestedCommand` `= SCRIPT(arguments: item, position, column)`
: this command is called when the context menu is requested, usually by pressing the right mouse button, but, e.g., on Windows there is also a key for this. This is called before showing the context menu defined by the contextMenu attribute. "position" indicates the global position where the context menu should be opened.

Example 4.23. ListView

Have a look at the module **TestListView**. This module features the dynamic creation and removal of different list items.

Figure 4.15. TestListView Module



Header1	Header2	Header3
☐ t1	t2	t3
☐ t4	t5	t6

Value: t1,t2,t3

Item Filter: .*1$

4.4.26. IconView

IconView shows a grid of icons with text. The items can be set by using the dynamic scripting API.

Dynamic scripting: MLABIconViewControl

```
IconView {
  allowRenaming = BOOL            [No]
  autoArrange   = BOOL            [Yes]
  wordWrap      = BOOL            [No]
  maxTextLength = INT             [255]
  maxItemWidth  = INT
  selectionMode = ENUM            [Single]
  arrangement   = ENUM            [TopToBottom]
  resizeMode    = ENUM            [Fixed]
  itemTextPos   = ENUM            [Right]
  spacing       = INT

  selectionChangedCommand    = SCRIPT
  currentChangedCommand      = SCRIPT
  selectedCommand            = SCRIPT
  doubleClickedCommand       = SCRIPT
  returnPressedCommand       = SCRIPT
  itemRenamedCommand         = SCRIPT
  clickedCommand             = SCRIPT
  rightButtonClickedCommand = SCRIPT
  pressedCommand             = SCRIPT
  rightButtonPressedCommand = SCRIPT


  contextMenuOnEmptyList  = BOOL  [Yes]
  contextMenu {
    // See definition of SubMenu
  }
}
```

`allowRenaming` `= BOOL (default: No)`
  sets whether in-place renaming of items is allowed.

`autoArrange` `= BOOL (default: Yes)`
  sets whether items should be arranged anew when new items are inserted.

`resizeMode` `= ENUM (default: Fixed)`
: sets whether the items should be arranged when the view is resized.

  Possible values: Fixed, Adjust

`wordWrap` `= BOOL (default: No)`
: sets whether words are wrapped in the text.

`maxTextLength` `= INT (default: 255)`
: sets the maximum number of displayed chars.

`maxItemWidth` `= INT`
: sets the maximum width an item can have.

`selectionMode` `= ENUM (default: Single)`
: defines if selection is possible and if multiple items can be selected at a time.

  Possible values: Single, Extended, Multi, NoSelection

  See selectionMode for details.

`arrangement` `= ENUM (default: TopToBottom)`
: defines how items are arranged.

  Possible values: LeftToRight, TopToBottom

`itemTextPos` `= ENUM (default: Right)`
: sets the position of the text.

  Possible values: Right, Bottom

`spacing` `= INT`
: defines the spacing between items.

`contextMenu`
: define a context menu to show on right-click the list. See SubMenu on how to define a menu.

`contextMenuOnEmptyList` `= BOOL (default: Yes)`
: sets whether the user's contextMenu should be shown if the list has no entries.

`selectionChangedCommand` `= SCRIPT`
: defines a script command that is called when the selection has changed. If you want to get the selected item, call `selectedItem()` on the iconview.

`selectedCommand` `= SCRIPT (argument: index)`
: defines a script command that is called when a single item is selected (in Single selection mode).

`currentChangedCommand` `= SCRIPT (argument: index)`
: defines a script command that is called when the current item has changed.

`doubleClickedCommand` `= SCRIPT (argument: index)`
: defines a script command that is called when an item is double-clicked.

`returnPressedCommand` `= SCRIPT (argument: index)`
: defines a script command that is called when an item is renamed.

`itemRenamedCommand` `= SCRIPT (argument: index, newvalue)`
: defines a script command that is called when an item is renamed.

`clickedCommand` `= SCRIPT (argument: index)`
: defines a script command that is called when an item is clicked with the left mouse button (mouse button pressed and released).

rightButtonClickedCommand = SCRIPT (argument: index)
defines a script command that is called when an item is clicked with the right mouse button (mouse button pressed and released).

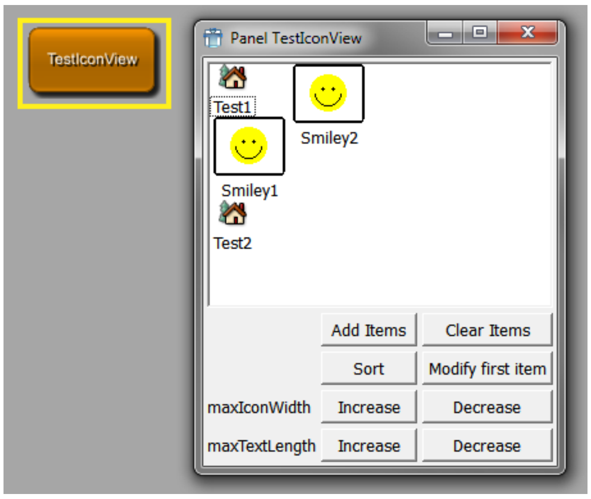
pressedCommand = SCRIPT (argument: index)
defines a script command that is called when the left mouse button is pressed on an item. This can, e.g., be used to initiate dragging.

rightButtonPressedCommand = SCRIPT (argument: index)
defines a script command that is called when the right mouse button is pressed on an item. This can, e.g., be used to initiate dragging.

Example 4.24. IconView

Have a look at the module **TestIconView**. This module features the dynamic adding and removing of icon items, as well as a scripting example on how to react on clicking an icon.

Figure 4.16. TestIconView Module



4.5. Decoration GUI Controls

4.5.1. Label

Label shows a RichText label which can be multiline. The label content can be given as a text or by the string value of a field.

Label is derived from Frame.

Dynamic scripting: MLABLabelControl

```
Label STRING {
    title         = STRING
    titleField    = FIELD
    image         = FILE
    indent        = INT
    buddy         = NAME
    textAlignment = ENUM
    textWrap      = ENUM      [SingleLine]
    textFormat    = ENUM      [Auto]
    trim          = ENUM      [None]
    selectable    = BOOL      [No]
    allowLinks    = BOOL      [No]

    linkActivatedCommand = SCRIPT
    linkHoveredCommand   = SCRIPT

    // Additional: tags for Frame
}
```

title = STRING
: sets the text of the label.

titleField = FIELD
: specifies a field that provides the text for the label (text is updated when field changes).

image = FILE
: specifies a pixmap that is shown on the label.

indent = INT
: sets the number of pixels to indent the text.

buddy = NAME
: sets the name of another control that is used as "buddy" of the label which gets the input focus when the label gets the focus (e.g., by pressing an ALT key). Use the & char to set a keyboard shortcut.

textAlignment = ENUM
: defines the alignment of the text in the label.

  Possible values: Auto, TopLeft, Top, TopCenter, TopRight, Left, Center, Right, BottomLeft, Bottom, BottomCenter, BottomRight

textWrap = ENUM (default: SingleLine)
: defines how the text in the label is wrapped.

  Possible values: SingleLine, WordBreak

textFormat = ENUM (default: Auto)
: defines the text format. The default is Auto, which searches the first text line for <> tags and switches between Rich and Plain. For keyboard shortcuts, write a & char in the plain text (&& means a literal &). In Rich mode you can use html-like syntax for the label.

  Possible values: Auto, Rich, Plain

trim = ENUM (default: None)
: trims the string.

  Possible values: Left, Center, Right, None

  Left: "...LongText"

  Center: "Long...Text"

  Right : "LongText..."

  None: No trimming

selectable = BOOL (default: No)
: sets whether the selection of text is allowed with the mouse.

allowLinks = BOOL (default: No)
: sets whether clicking on hyper links is allowed. It also enables linkHoveredCommand and linkActivatedCommand. If the linkActivatedCommand is not set, the links are opened via the external program given in MeVisLab preferences.

linkHoveredCommand = SCRIPT (arguments: String)
: defines a command that is called when the user hovers over a link and allowLinks is set to true.

linkActivatedCommand = SCRIPT (arguments: String)
: defines a command that is called when the user clicks on a link and allowLinks is set to true.

4.5.2. Image

Control that shows an image. The image can be automatically resized to fit the available space.

Image is derived from Frame.

Dynamic scripting: MLABImageControl

```
Image {
  image       = FILE
  scaleFactor = FLOAT   [1.0]
  autoResize  = BOOL    [No]

  // Additional: tags for Frame
}
```

image = FILE
: specifier the image to be shown. The recommended image format is PNG.

scaleFactor = FLOAT (default: 1.0)
: sets the scale factor of the image.

autoResize = BOOL (default: No)
: sets whether the image is resized according to its aspect ratio to fit the available space.

4.5.3. Separator

Separator is a visual separator (like <HR> in html). It has a direction and a frame style. Depending on the direction, `expandX` and `expandY` are automatically set to expanding.

Separator is derived from Frame.

Dynamic scripting: MLABSeparatorControl

```
Separator {
  direction = ENUM    [Horizontal]

  // Additional: tags for Frame
}
```

direction = ENUM (default: Horizontal)
: defines the direction of the separator.

  Possible values: Vertical, Horizontal

4.5.4. Empty

Empty is a control which represents empty space. Depending on its size policy, it will extend or be of fixed size. Its tags are derived from the basic control, typically one only uses the given tag.

There are four aliases that have useful presets in vertical and horizontal direction:

`VSpacer`, `SpacerX` - control that fills the space vertically by expanding (when you have a control with a stretch factor, you might want to change the stretch factor as well).

`HSpacer`, `SpacerY` - control that fills the space horizontally by expanding (when you have a control with a stretch factor, you might want to change the stretch factor as well).

Empty is derived from Control.

```
Empty {
  expandX  = ENUM
  expandY  = ENUM
  stretchX = INT
  stretchY = INT
  w        = INT
  h        = INT
}
```

4.5.5. ProgressBar

ProgressBar shows the current status as a bar between 0% and 100%. The status is controlled by a FloatField which should yield values from 0 to 1.0. The field needs priority 0 to cause an update of the progress immediately, otherwise the update is not guaranteed.

ProgressBar is derived from Frame.

Dynamic scripting: MLABProgressBarControl

```
ProgressBar FIELD {
  textVisible = BOOL     [Yes]
  orientation = ENUM     [Horizontal]

  // Additional: tags for frame
}
```

`textVisible` `= BOOL (default: Yes)`
sets whether the current completed percentage should be displayed.

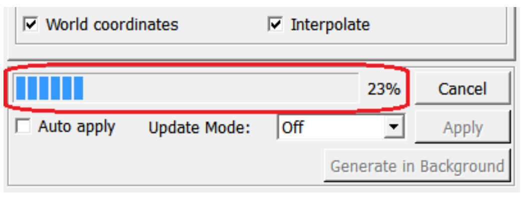
`orientation` `= ENUM (default: Horizontal)`
sets the the orientation of the progress bar.

Possible values: Horizontal, Vertical

Example 4.25. ProgressBar

Have a look at the module **WEMIsoSurface**. On this module, a ProgressBar is used to display the progress of scanning the slices of the input image.

Figure 4.17. ProgressBar Example



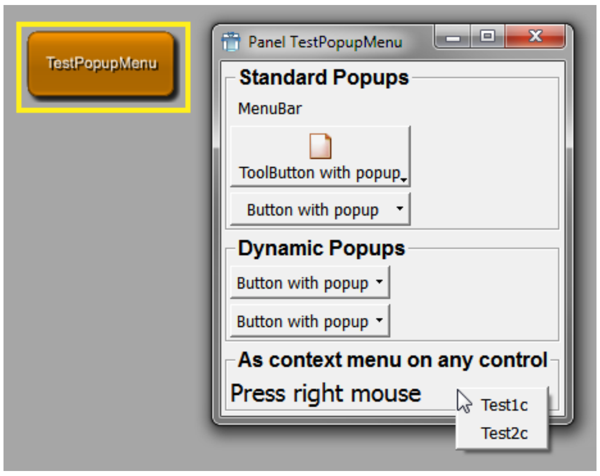
4.6. Menu GUI Controls

Menus can be created at various GUI controls, e.g., as a context menu. All these menus start at the level of a SubMenu as given in the following section.

Example 4.26. PopupMenu, SubMenu and MenuItem

For the use of the controls PopupMenu, SubMenu and MenuItem, have a look at the module **TestPopupMenu**.

Figure 4.18. TestPopupMenu Module



4.6.1. PopupMenu

A PopupMenu defines a menu that can be popped up via scripting. It is derived from the SubMenu control and is not visible by default. It should be given a name and then be shown via the popup() method. It pops up at the cursor position or at a screen point given by the caller.

Dynamic scripting: MLABPopupMenuControl

```
PopupMenu {
  name        = NAME
  showCommand = SCRIPT
  hideCommand = SCRIPT

  // possible children:
  Separator   = ""
  SubMenu     = NAME { ... }
  MenuItem    = NAME { ... }

  // advanced children:
  Action      = NAME
}
```

name = NAME
    sets the internal name used in scripting (like Control name/instanceName).

showCommand = SCRIPT

hideCommand = SCRIPT
    defines script commands that are called when SubMenu is shown/hidden.

4.6.2. SubMenu

A SubMenu can contain multiple MenuItems, SubMenus, Separators and Actions. When an item is selected, a script command is called on the item. An ALT keyboard shortcut can be assigned with the "&" character.

Actions are an advanced concept and are currently only supported for the internal MeVisLab menus.

Dynamic scripting: MLABPopupMenuControl

```
SubMenu STRING {
  name        = NAME
  showCommand = SCRIPT
  hideCommand = SCRIPT

  itemActivatedCommand = SCRIPT
  // possible children:
  Separator = ""
  SubMenu   = NAME { ... }
  MenuItem  = NAME { ... }

  // advanced children:
  Action    = NAME
}
```

name = NAME
: sets the internal name used in scripting (like Control name/instanceName).

showCommand = SCRIPT

hideCommand = SCRIPT
: defines script commands that are called when SubMenu is shown/hidden.

itemActivatedCommand = SCRIPT
: defines a script command that is called when a direct child of the SubMenu is activated.

4.6.2.1. MenuItem

MenuItems can be declared inside of a SubMenu or a tag used as a submenu (e.g., `contextMenu`, `menuBar`).

Dynamic scripting: MLABPopupMenuControl, using the name of the menu item.

```
MenuItem STRING {
  command   = SCRIPT
  name      = NAME
  field     = NAME
  enabled   = BOOL                  [Yes]
  dependsOn = FIELDEXPRESSION
  visibleOn = FIELDEXPRESSION
  checked   = BOOL                  [No]
  icon      = FILE
  accel     = KEYSEQUENCE
  whatsThis = STRING

  // advanced:
  slot      = QTSLOT
  receiver  = NAME

  // possible child:
  TouchBarItem { ... }
}
```

command = SCRIPT (arguments: name)
: defines a script command that is called when the item is selected.

name = NAME
: sets a name for this item that can be used in the interface of the SubMenu to talk to the item via scripting.

field = NAME
: sets an existing field which can be of type bool or trigger. If this is used, selecting this menu item either toggles the Boolean value or notifies the trigger field.

accel = KEYSEQUENCE
: sets an additional accelerator key sequence.

enabled = BOOL (default: Yes)
: sets whether the item is enabled (or disabled/grayed out otherwise).

dependsOn, **visibleOn** = FIELDEXPRESSION
: determines whether the button is disabled/hidden, otherwise enabled/visible. See dependsOn/visibleOn of the generic Control for a more detailed explanation of the expression.

whatsThis = STRING
: sets an additional explanation text.

icon = FILE
: specifies an additional icon that is shown.

checked = BOOL (default: No)
: sets the initial state for toggle items.

slot = QTSLOT
: specifies a Qt slot instead of a script command (used for MeVisLab internal menus). This is an advanced feature.

receiver = NAME
: specifes the name of an Qt receiver object (used for MeVisLab internal menus). This is an advanced feature.

4.6.2.2. TouchBarItem

Note: At the time of writing, TouchBarItems are only applicable to Apple Macintosh computers with a Touch Bar running macOS.

TouchBarItems can be declared inside of a MenuItem or an Action.

```
TouchBarItem {
  id        = NAME

  // One of the following three entries must be used
  imageName = NAME
  icon      = IMAGEFILE
  title     = TRANSLATEDSTRING

  customizationLabel = TRANSLATEDSTRING
  visibilityPriority = FLOAT [0]
}
```

id = NAME
: The identifier for this item. This value must be globally unique. If no name is provided, it is derived from entries of the MenuItem and prefixed with `de.mevis.mevislab.touchbar.item.` .

imageName = NAME
: Creates a touch bar item with an image object associated with this specified name.

icon = IMAGEFILE
: Creates a touch bar item with an image object using the specified file.

title = TRANSLATEDSTRING
: Creates a touch bar item using this string as the title.

customizationLabel = TRANSLATEDSTRING
: The user-visible string identifying this item during touch bar customization. If no string is provided, it is derived from the label of the MenuItem or Action.

visibilityPriority = FLOAT (default: 0)
: If there are more items in the Touch Bar than can be displayed, some will be hidden. Items with high visibility priority will be hidden after items with low visibility priority. 1000 is a high priority value, 0 is normal priority, and -1000 is a low priority value.

4.6.2.3. Separator

Creates a separator in the menu.

```
Separator = ""
```

4.7. Complex GUI Controls

4.7.1. Panel

Panel is a control that can "clone" a subregion of a given module's windows. If `panel` and `panelByGroupTitle` are not specified, the control shows the window of a module given by its name. If the window is not specified, the whole default window is shown.

This also clones all FieldListeners contained in the cloned code, so that a cloned panel should work like the original one. The window you get when you call `window()` in the context of the cloned script will be the window in which the Panel is.

Note that no field connections can be established between fields that are shown on a macro's GUI because of a `panel` declaration. In order to be able to establish a field connection to such a field, you need to declare the according field in the macro module's interface section.

Panel is derived from Control.

Dynamic scripting: MLABPanelControl

Tip

When you use the Panel control, you should use the `panel` tag and use the `panelName` tag in the module to mark the region you want to clone. This allows the developer of the module to see that someone is using that part of the module panel somewhere else.

Warning

`panelByGroupTitle` is deprecated and should not be used in new scripts (see above tip).

```
Panel {
  module = NAME
  panel  = NAME
  window = NAME

  // tags that should not be used any more in new panels:
  panelByGroupTitle = NAME
}
```

`module` `= NAME (required)`
: sets the name of the module in the network.

`panel` `= NAME`
: sets a name to search for in the given module by looking for a `panelName` tag with the name NAME.

`window` `= NAME`
: sets the name of the window to clone.

`panelByGroupTitle` `= NAME (deprecated!)`
: sets a name to search for by comparing NAME with the values of all group tags in the module's window.

Example 4.27. Panel

Have a look at the module **View3D**. As explained in the `Window` example, the View3D module defines four different windows. The first window (named 'View3D') defines a viewer and a settings panel. The latter has its `panelName` set to 'Settings'. The third window of the module (named 'Settings') just cuts out the settings part of the first window by using the `Panel` tag.

4.7.2. DynamicFrame

DynamicFrame shows a user-defined MDL script file or dynamically generated string. Its contents can be changed interactively from Python. This gives the user the power to create and update dynamically user interfaces in an application, without the need to specify the complete GUI when the application script is started.

The controls in the content of the frame (named with the `name` tag) are visible in the global scope of the window.

You can use the Python methods `setContentFile(string)` or `setContentString(string)`.

Dynamic scripting: MLABDynamicFrameControl

Have a look at the module **TestDynamicFrames** that shows how to use dynamic frames in scripting.

Tip

If you dynamically add modules to your application network, you can use this control to clone a panel of the new module or to show fields of the new module on the fly.

```
DynamicFrame {
  autoSize    = BOOL     [Yes]
  contentFile = FILE
}
```

`autoSize` `= BOOL (default: Yes)`
sets whether the current sizes of the contained GUI should be used.

`contentFile` `= FILE`
specifies the initially shown MDL file. If no file is specified, the DynamicFrame is empty.

4.7.3. Viewer

Viewer shows an OpenInventor viewer. Typically the Inventor viewer is taken from a SoViewerNode module in the network, especially SoExaminerViewer, SoRenderArea, etc. A viewer has to be attached to a SoNode field, typically the "self" field of an InventorModule. If you specify a `type`, the viewer is generated independent from any viewer node in the network.

Dynamic scripting: MLABInventorViewerControl

Tip

If you want to access the internal Inventor viewer, you should use the viewer together with a SoExaminerViewer or a SoRenderArea on a network and use the 'self' field of that module for the viewer.

```
Viewer FIELD {
  viewing         = BOOL       [Yes]
  hiResRendering  = BOOL       [No]
  backgroundColor = COLOR
  type            = NAME
  clone           = BOOL       [No]
  delay           = BOOL       [Yes]
  values          = STRING

  popup           = BOOL       [No]

  popupMenu {
    // see tags for SubMenu
  }
}
```

`viewing` `= BOOL (default: Yes)`
sets whether the viewer is in viewing mode.

`hiResRendering` `= BOOL (default: No)`
sets whether the viewer enables OpenGL for high-resolution drawing on supported systems. Because adding more pixels to renderbuffers has performance implications, you must explicitly opt in.

popup = BOOL (default: No)
: sets whether the viewer has a pop-up menu.

backgroundColor = COLOR
: specifies the background color of the viewer.

type = NAME
: sets the type of the viewer if the SoNodeField is not from a SoViewerNode module.

  Possible values: SoExaminerViewer, SoRenderArea, SoCustomExaminerViewer

clone = BOOL (default: No)
: sets whether the viewer shoud be cloned (this is automatically done when two viewers are show from the same module in the network).

delay = BOOL (default: Yes)
: sets whether the viewer is created in delayed mode. That means that its content is rendered AFTER the window is drawn the first time, to avoid waiting for the drawing of the rest of the GUI.

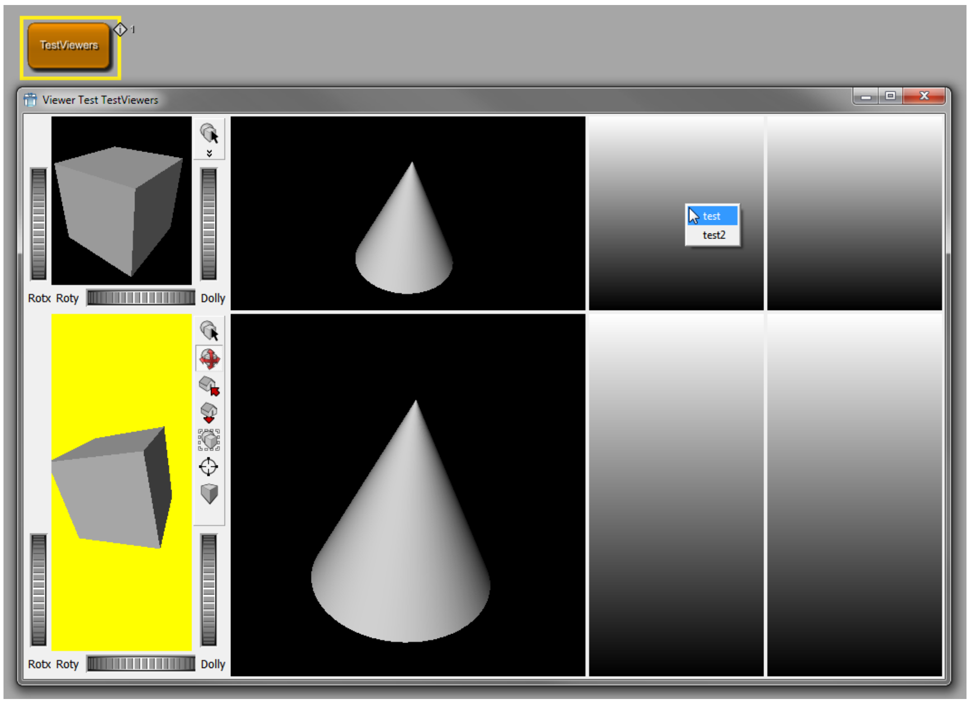
values = STRING
: sets the field values of the viewer in Inventor style (you need to know what you are doing and which fields are available).

popupMenu
: defines a menu that is shown when the user clicks the right mouse button on the viewer. The internal pop-up menu of the viewer (from OpenInventor) has to be turned off, otherwise this menu will not be shown. See SubMenu for details on how to define a menu.

Example 4.28. Viewer

Have a look at the module **TestViewers**. This module shows the use of the `Viewer` tag in different settings.

Figure 4.19. TestViewers Module



4.7.4. PathBrowser

PathBrowser displays a directory tree for browsing. Clicking a directory will open and show its subdirectories. Double-clicking a directory selects a directory. Typically this is used together with the DicomBrowser.

Pressing "r" on a PathBrowser always resets the current path to the original root path.

PathBrowser is derived from Control.

Dynamic scripting: MLABPathBrowserControl

```
PathBrowser {
  root        = PATH
  visibleRows = INT
  minLength   = INT
  sortBy      = STRING       [Name]
  cd          = STRING

  pathSelectedCommand   = SCRIPT
  pathDblClickedCommand = SCRIPT
}
```

`root` `= PATH`
  specifies the root path of the PathBrowser. If not given or if PATH does not exist or is not readable, the current working directory is used.

`visibleRows` `= INT`
  sets the minimum number of visible rows (defining the minimum height).

`minLength` `= INT`
  sets the minimum width to show INT characters.

`sortBy` `= ENUM (default: Name)`
  specifies the sorting order of directories.

  Possible values: Name, Size, Time, Unsorted

`cd` `= PATH`
  specifies the relative path from `root` to the initially opened subdirectory.

`pathSelectedCommand` `= SCRIPT (argument: absolute path)`**`pathDblClickedCommand`** `= SCRIPT (argument: absolute path)`
  defines a script command that is called when the path is selected/double-clicked with left mouse button.

4.7.5. DicomBrowser and DicomBrowserTable

The DicomBrowser displays a configurable tree view on a set of Dicom files. The data is arranged according to the Dicom hierarchy of the files. The DicomBrowser allows copying, moving and linking (only on Unix, yet) of Dicom data by dragging between DicomBrowsers. Dropping an entry from a DicomBrowser to a PathBrowser sets the Path of the PathBrowser to the directory of the dropped entry. Deleting selected datasets is also supported by pressing DEL.

A DicomBrowserTable that is connected to a DicomBrowser always shows a table view of the dataset currently selected in the DicomBrowser. The DicomBrowser and the DicomBrowserTable are synchronized in both directions. Double-clicking a dataset selects it for opening by other controls.

Pressing "r" on these controls reloads the currently viewed datasets, thus allowing the DicomBrowser to be synchronized with external modified directories.

DicomBrowser and DicomBrowserTable are derived from Control.

Dynamic scripting: MLABDicomBrowserControl and MLABDicomBrowserTableControl

```
DicomBrowser {
  name           = STRING
  visibleRows    = INT
  minLength      = INT
  project        = STRING
  hierarchy      = STRING        [first one available]
  rootDir        = STRING
  treeRootTitle  = STRING
  fileExtension  = STRING        [dcm]
  includeFilter  = STRING
  excludeFilter  = STRING
  recursive      = BOOL          [Yes]
  showDicomFiles = BOOL          [Yes]

  selectedCommand          = SCRIPT
  deletionRequestedCommand = SCRIPT
  dblClickedCommand        = SCRIPT
}
```

```
DicomBrowserTable {
  name                   = STRING
  visibleRows            = INT
  minLength              = INT
  contextMenuOnEmptyList = BOOL

  contextMenu {
    // See definition of SubMenu
  }
}
Execute = "*py: ctx.control("myDicomBrowser").setTableView(ctx.control("myDicomBrowserTable")) *"
```

`visibleRows` `= INT`
: sets the minimum number of visible rows (defining the minimum height).

`minLength` `= INT`
: sets the minimum width to show INT characters.

`project` `= STRING`
: specifies the name of a DicomProject with presets for the DicomBrowser.

`hierarchy` `= STRING`
: specifies the name of a Dicom hierarchy which is displayed by the DicomBrowser.

`rootDir` `= PATH`
: specifies the path to DicomFiles. Setting a PathBrowser overwrites this value.

`treeRootTitle` `= STRING`
: sets the title of the tree view root node which is empty by default.

`fileExtension` `= STRING`
: sets the filter of the file search to files with this extension.

`includeFilter` `= STRING`
: sets a filter string to include files in the search.

`excludeFilter` `= STRING`
: sets a filter to exclude files from the search.

`recursive` `= BOOL`
: sets whether files are searched recursively.

`showDicomFiles` `= BOOL (default: Yes)`
: sets whether the leaves of a Dicom hierarchy in the Browser are shown.

`contextMenu`
: defines a context menu to show on right-click the list. See SubMenu on how to define a menu.

`contextMenuOnEmptyList` `= BOOL (default: Yes)`
: sets whether the user's contextMenu is shown if the list has no entries.

selectedCommand = SCRIPT (argument: absolute path of dataset)
defines a script command that is called when a dataset is selected.

deletionRequestedCommand = SCRIPT (argument: absolute path of dataset)
defines a script command that is called when a dataset should be deleted.

dblClickedCommand = SCRIPT (argument: absolute path of dataset)
defines a script command that is called when a dataset is double-clicked.

4.7.6. MoviePlayer

The MoviePlayer allows to play AVI movies. The movie can be given as a filename and the control can be controlled interactively by Python.

MoviePlayer is derived from Control.

Dynamic scripting: MLABMoviePlayerControl

```
MoviePlayer {
  filename          = FILE
  autoStart         = BOOL    [No]
  enableContextMenu = BOOL    [Yes]
  showControls      = BOOL    [Yes]
}
```

filename = FILE
specifies the filename of the movie (should be an AVI).

autoStart = BOOL (default: No)
sets whether the movie should start immediately.

enableContextMenu = BOOL (default: Yes)
sets whether a context menu with advanced control functions is enabled.

showControls = BOOL (default: Yes)
sets whether play, stop, pause, etc., controls are shown to the user.

4.7.7. ScreenshotGallery

The ScreenshotGallery can be used in an application to collect screenshots for that application. It can be used via scripting to get a list of taken screenshots and movies, to control to which directory these files are written, etc.

ScreenshotGallery is derived from Control.

Dynamic scripting: MLABScreenshotGalleryControl

```
ScreenshotGallery {
  application = NAME
}
```

application = NAME
defines the name of the application (macro module) whose screenshots should be stored.

4.7.8. WebEngineView

The MDL WebEngineView provides a complete web engine to the MDL developer. It is based on the open-source Chromium engine which powers most browsers nowadays.

We recommand that you use this control only to display content controlled by you, since we can not provide the same level/frequency of security updates as the main browser applications, but at the same time use the same broad code base which is subject to intense scrutiny regarding code flaws.

It offers:

- A standards compliant web browser.
- ECMAScript 2021, CSS2, CSS3 and HTML5.
- Scripting interface to control the browser content, text selection, menu, etc.
- Scripting interface to call browser JavaScript from MeVisLab Python.
- Access to MeVisLab objects from within JavaScript through the WebChannel API (see the "Scripting" demo in the TestWebEngineView example module).
- WebInspector for debugging HTML, CSS and JavaScript (Inspect option on context menu).
- PDF Viewing.

Note

This requires setting a special flag from Python code after the control has been created:

```
from PythonQt.QtWebEngineWidgets import QWebEnginePage, QWebEngineSettings
...
webControl = ctx.control("yourwebview")
webControl.webPage().settings().setAttribute(QWebEngineSettings.PluginsEnabled, True)
```

You might call this, e.g., from an Execute command in your panel.

Note that this enables support for all Pepper API plugins!

WebEngineView is derived from Control.

Dynamic scripting: MLABWebEngineViewControl

```
WebView {
  contentUrl               = URL
  contentFile              = FILE
  contentString            = STRING
  contentStringBaseUrl     = URL

  loadStartedCommand       = SCRIPT
  loadProgressCommand      = SCRIPT
  loadFinishedCommand      = SCRIPT

  linkClickedCommand       = SCRIPT
  urlChangedCommand        = SCRIPT
  selectionChangedCommand  = SCRIPT

  logConsoleOutput         = BOOL
  enablePrinting           = BOOL   [No]

  linkDelegation           = ENUM
```

contentUrl = URL
: sets the content of the WebEngineView to the given Url, e.g., https://www.mevislab.de

contentFile = FILE
: sets the content of the WebEngineView to the given local file, e.g., $(LOCAL)/SomeFile.html

contentString = STRING
: sets the content of the WebEngineView to the given HTML string. If no contentStringBaseUrl is given, the $(LOCAL) MDL variable is used as baseUrl for the string, so relative links are resolved relative to $(LOCAL).

`contentStringBaseUrl` = URL
: sets a different base Url when using contentString.

`loadStartedCommand` = SCRIPT
: defines a script command that is called when the WebEngineView starts loading a document.

`loadProgressCommand` = SCRIPT (argument: float progress)
: defines a script command that is called with values from 0. to 1. while the WebEngineView loads the document.

`loadFinishedCommand` = SCRIPT (argument: bool success)
: defines a script command that is called when the document has finished loading.

`linkClickedCommand` = SCRIPT (arguments: QUrl)
: defines a script command that is called for all clicked links.

`urlChangedCommand` = SCRIPT (arguments: QUrl)
: in contrast to the command above this command is always called when the displayed URL changes, not only if a link was clicked. This may also incorporate page forwarding.

`selectionChangedCommand` = SCRIPT
: defines a script command that is called whenever the text selection in the WebEngineView changes.

`enablePrinting` = BOOL (default: No)
: defines if a JavaScript call of window.print() results in opening a print dialog and printing of the content. It will also add a print entry to the context menu of the view if enabled.

`linkDelegation` = ENUM (default: depends on linkClickedCommand)
: defines how clicks on links are handled. All links that are delegated are passed to the **linkClickedCommand** instead of switching the WebEngineView to the Url internally. By default links are delegated if the linkClickedCommand is set. If the linkClickedCommand is not implemented but linkDelegation is set to All, the delegated URLs are passed to MeVisLab, which uses the default programs registered for the scheme of the url to open the URL.

  - None: no links are delegated
  - All: all clicked links are delegated

4.7.9. WebView

The MDL WebView provides a complete web engine to the MDL developer. It is based on the open-source WebKit engine which powers Apple's Safari.

Since the underlying widget isn't maintained in Qt anymore we recommend that you rather use the WebEngineView control if you don't need the special features of this control. You should especially not display external content that you don't control with it, since there are known security issues with this widget.

It offers:

- A standards compliant web browser.
- JavaScript 1.5, CSS2, CSS3 and HTML5 Scripting interface to control the browser content, text selection, menu, etc.
- Scripting interface to call browser JavaScript from MeVisLab Python.
- Scripting of MeVisLab objects from within JavaScript (e.g., MLAB, ctx).

- Support for NSAPI conformant browser plugins (e.g., Flash, Silverlight), typically plugins installed for Firefox plugins will just work.
- Support for embedded MDL controls inside of HTML documents.
- WebInspector for debugging HTML, CSS and JavaScript (Inspect option on context menu).

The WebView has a rich scripting API which you can find in the MeVisLab Scripting Reference (look for MLABWebViewControl).

The WebView has special support for local URLs that are relative to MeVisLab packages. You can write a URL relative to a MeVisLab package by writing href="/MLAB_PackageGroup_PackageName/...", e.g., href = "/MLAB_MeVisLab_Standard/Modules/Macros/Tests/GUI/TestWebView/Intro.html".

For detailed examples, have a look at the **TestWebView** module which shows most of the possibilities of the WebView.

WebView is derived from Control.

Dynamic scripting: MLABWebViewControl

```
WebView {
  contentUrl              = URL
  contentFile             = FILE
  contentString           = STRING
  contentStringBaseUrl    = URL

  loadStartedCommand      = SCRIPT
  loadProgressCommand     = SCRIPT
  loadFinishedCommand     = SCRIPT

  enableScriptingObjects  = BOOL        [No]
  enableEmbeddedMDL       = BOOL        [No]
  enablePlugins           = BOOL        [No]
  allowPopups             = BOOL        [No]

  javaScriptInitCommand   = SCRIPT
  linkClickedCommand      = SCRIPT
  selectionChangedCommand = SCRIPT

  linkDelegation          = ENUM        [Extern]
```

`contentUrl` `= URL`
: sets the content of the WebView to the given Url, e.g., https://www.mevislab.de

`contentFile` `= FILE`
: sets the content of the WebView to the given local file, e.g., $(LOCAL)/SomeFile.html

`contentString` `= STRING`
: sets the content of the WebView to the given HTML string. If no contentStringBaseUrl is given, the $(LOCAL) MDL variable is used as baseUrl for the string, so relative links are resolved relative to $(LOCAL).

`contentStringBaseUrl` `= URL`
: sets a different base Url when using contentString.

`loadStartedCommand` `= SCRIPT`
: defines a script command that is called when the WebView starts loading a document.

`loadProgressCommand` `= SCRIPT (argument: float progress)`
: defines a script command that is called with values from 0. to 1. while the WebView loads the document.

`loadFinishedCommand` `= SCRIPT (argument: bool success)`
: defines a script command that is called when the document has finished loading.

enableScriptingObjects = BOOL (default: No)
: sets whether MeVisLab objects like ctx, MLAB, MLABFileManager, etc., are added to the JavaScript engine of the WebView, so that they can be used to script MeVisLab from within the WebView JavaScripting.

enableEmbeddedMDL = BOOL (default: No)
: sets whether MDL control are embedded inside of HTML pages using the HTML object tag. Have a look at the TestWebView module for an example of embedded MDL.

  The window/panel/module parameters are optional. If no module is given, the current module associated with the MDL file is used. If no window is given, the default window is used. If a panel is given, MeVisLab searches for an MDL section with panelName equal to the given panel name.

```
<object type="text/mevislab-mdl" >
<param name="window" value="nameOfSomeMDLWindow"> </param>
<param name="panel"  value="nameOfSomePanel">     </param>
<param name="module" value="instanceNameOfModule"></param>
</object>
```

enablePlugins = BOOL (default: No)
: sets whether NSAPI plugin support is enabled. You need to enable this so that Flash/Silverlight can be used inside of HTML pages.

allowPopups = BOOL (default: No)
: sets whether pages can create popup pages from JavaScript or when clicking on a link. This is probably not advisable for unknown sources, since there is no popup-blocker.

Note

MeVisLab scripting objects and embedded MDL are not available in popups.

javaScriptInitCommand = SCRIPT
: defines a script command that is called when a the JavaScript engine of a HTML page is reinitialized. It can be used to add objects to the engine.

linkClickedCommand = SCRIPT (arguments: QUrl)
: defines a script command that is called for all clicked links that are delegated via the linkDelegation tag.

selectionChangedCommand = SCRIPT
: defines a script command that is called whenever the text selection in the WebView changes.

linkDelegation = ENUM (default: External)
: defines how clicks on links are handled. All links that are delegated are passed to the **linkClickedCommand** instead of switching the WebView to the Url internally. By default, all external links (which are not file:// links) are delegated. If the linkClickedCommand is not implemented, the delegated URLs are passed to MeVisLab, which uses the default programs registered for the scheme of the url to open the URL.

  - None: no links are delegated
  - External: external links (which do not point to the local disk using file://) are delegated
  - All: all links that are clicked are delegated

4.7.10. GraphicsView

The MDL GraphicsView offers a freely configurable area which can contain:

- Graphics items (Lines, Pixmaps, RichText...).

- MDL Panels.
- Inventor Render Areas.
- WebKit HTML.
- Vertical, Horizontal, Grid and Anchor layouts.
- HotArea layout with HotAreas.

These items can be arranged and blended over each other as desired. This allows to create new types of interactive GUIs including animated transitions.

For detailed examples, have a look at the **TestGraphicsView** and **TestGraphicsViewHotArea** modules which demonstrate some of the possibilities.

GraphicsView is derived from Control.

Dynamic scripting: MLABGraphicsViewControl

```
GraphicsView {
}
```

4.7.11. ItemModelView

The MDL ItemModelView provides a view on the ItemModel base object contained in the given field which represents an abstract hierarchical item model with generic named attributes. The user can select which attributes are displayed in the resulting table and in which way.

This control resembles the ListView control in appearance, but takes a more abstract approach and clearly differentiates between model and view.

```
ItemModelView FIELD {
  selectionField      = FIELD
  currentField        = FIELD
  doubleClickedField  = FIELD
  clickedColumnField  = FIELD
  selectableAttribute = NAME          [none]
  idAttribute         = NAME          [none]
  idAsFullPath        = BOOL          [false]
  idPathSeparator     = STRING
  idSeparator         = STRING
  selectionMode       = ENUM          [Single]
  tabDirection        = ENUM          [Vertical]
  sortByColumn        = INT           [-1]
  sortAscending       = BOOL          [true]
  header              = BOOL          [true]
  alternatingRowColors= BOOL          [false]
  autoExpandAll       = BOOL          [false]
  autoExpandToDepth   = INT           [0]
  visibleRows         = INT           [5]
  editTrigger         = STRING        [SelectedClicked and EditKeyPressed]

  editableAttribute         = NAME    [false]
  checkboxEditableAttribute = NAME    [false]
  automaticParentCheckboxState = BOOL [false]
  colorAttribute            = NAME    [none]
  tooltipAttribute          = NAME    [none]
  boldFontAttribute         = NAME    [false]
  italicFontAttribute       = NAME    [false]
  floatDecimalPlaces        = INT     [-1]
  automaticResize           = BOOL    [true]
  align                     = ENUM    [Left]
  headerAlign               = ENUM    [Left]

  DerivedAttribute NAME {
    sourceAttribute       = NAME
    defaultValue          = STRING
    defaultPathValue      = FILE
    Case STRING {
      value               = STRING
      pathValue           = FILE
    }
    ...
  }
  ...

  ComputedAttribute NAME {
    expression            = EXPRESSION
  }
  ...

  Column STRING {
    displayAttribute          = NAME   (see text)
    displayAsColor            = BOOL   [false]
    editAttribute             = NAME   (see text)
    editableAttribute         = NAME   (see text)
    checkboxAttribute         = NAME   (see text)
    checkboxEditableAttribute = NAME   (see text)
    automaticParentCheckboxState = BOOL [false]
    iconAttribute             = NAME   [none]
    tooltipAttribute          = NAME   [none]
    colorAttribute            = NAME   [none]
    sortAttributes            = STRING (see text)
    comboboxAttribute         = NAME   [none]
    comboboxTooltipsAttribute = NAME   [none]
    comboboxItemDelimiter     = STRING [|]
    boldFontAttribute         = NAME   [false]
    italicFontAttribute       = NAME   [false]
    visibleOn                 = FIELDEXPRESSION [1]
    floatDecimalPlaces        = INT    [-1]
    automaticResize           = BOOL   (see text)
    align                     = ENUM   (see text)
    headerAlign               = ENUM   (see text)
  }
  ...
}
```

`selectionField` `= FIELD`
: a string field that will contain the currently selected items.

  How items are identified must be specified with the idAttribute and following tags.

`currentField` `= FIELD`
: a string field that will contain the current (focused) item.

`doubleClickedField` `= FIELD`
: a string field that will receive the last double-clicked item.

`clickedColumnField` `= FIELD`
: an integer field that can be used in conjunction with the doubleClickedField and that contains the index of the column where the last click happened. This will be updated before the doubleClickedField is touched, but the clickedColumnField may not be touched if the column didn't change.

`selectableAttribute` `= STRING`
: specify the name of an attribute that will determine if an item can be selected. If no attribute is specified, the default is true.

`idAttribute` `= STRING`
: specify the name of an attribute that can be used to clearly identify items from the model, e.g., a unique name or a numerical id.

`idAsFullPath` `= BOOL`
: set this to TRUE or YES if the idAttributes of all parents are needed to clearly identify an item.

`idPathSeparator` `= STRING`
: if idAsFullPath is set, use this string to separate identifying value of the item and its parents. For a ItemModel representing the file system, this would ideally be the slash character, leading to a natural path id.

`idSeparator` `= BOOL`
: if several items must be specified (in the selectionField), use this string to separate the IDs.

`selectionMode` `= ENUM`
: the selection model of the control. The following values exist:

- Single - Only one item can be selected
- Extended - A continuous range of items can be selected
- Multi - Several disconnected items can be selected
- NoSelection - No items can be selected

`tabDirection` `= ENUM (default: Vertical)`
: defines the direction when jumping to the next editable field through the use of the Tab key. When Horizontal is selected, the cursor automatically switches to the next row when reaching the table border.

Possible values: Vertical, Horizontal

`sortByColumn` `= INT`
: specify which column to sort by initially. By default the items are sorted by the value used for the displayAttribute, but this can be overridden with the sortAttribute. Set this to -1 to disable sorting.

`sortAscending` `= BOOL`
: specify if sorting should initially be ascending or descending.

`header` `= BOOL`
: specify if the column headers should be shown.

`alternatingRowColors` `= BOOL`
: if set to true, use alternating background colors for the rows of the table.

`autoExpandAll` `= BOOL`
: specify if all items with sub-items should be expanded by default. This takes precedence over autoExpandToDepth, if both are specified.

`autoExpandToDepth` `= INT`
: specify the depth to which items should be automatically be expanded. Top-level items have depth 1. If you want to expand all items regardless of depth, you should rather use autoExpandAll

`visibleRows` `= INT`
: specify how many rows should be visible at least.

`editTrigger` `= STRING`
: specify what triggers editing of editable cells. This tag can appear multiple times to specify multiple edit triggers.

The available edit triggers are:

`NoEditTriggers`
: No editing possible.

`CurrentChanged`
: Editing start whenever current item changes.

`DoubleClicked`
: Editing starts when an item is double clicked.

`SelectedClicked`
: Editing starts when clicking on an already selected item.

`EditKeyPressed`
: Editing starts when the platform edit key has been pressed over an item.

`AnyKeyPressed`
: Editing starts when any key is pressed over an item.

`AllEditTriggers`
: Editing starts for all above actions.

`editableAttribute` `= NAME`
: give the name of an item attribute that specifies if cells should be editable by default. This can be overridden for single columns.

  You can use pseudo attribute names "true/yes" or "false/no" here to enable or disable editing independent from specific items.

`checkboxEditableAttribute` `= NAME`
: the same as editableAttribute for columns. You still need to specify a checkboxAttribute in the columns to display checkboxes.

`automaticParentCheckboxState` `= BOOL`
: the same as automaticParentCheckboxState for columns.

`colorAttribute` `= NAME`
: give the name of an item attribute that shall provide the default color for all columns.

  Colors can also be provided as strings, either as #rrggbb (hexadecimal notation, e.g., #ff0000), or as color name as defined in the list of SVG color keyword names.

`tooltipAttribute` `= NAME`
: same as the tooltipAttribute for columns, but this value applies to all columns.

`boldFontAttribute` `= NAME`
: same as the boldFontAttribute for columns, but this value applies to all columns.

`italicFontAttribute` `= NAME`
: same as the italicFontAttribute for columns, but this value applies to all columns.

`floatDecimalPlaces` `= INT`
: same as the floatDecimalPlaces for columns, but this value applies to all columns.

`automaticResize` `= BOOL`
: specify if all columns should resize automatically if their content changes. This can be overridden in single columns.

`align` `= ENUM`
: specify the default alignment for all columns. Possible values are Left, Right or Center

`headerAlign` `= ENUM`
: specify the default alignment of the header content for the whole table. Possible values are Left, Right or Center

`DerivedAttribute` `NAME`
: Sometimes one wants to change the color of an row depending on some attribute of the item, or wants to display an icon, but the color or icon should not be a property of the model but of the view. In this case one can use DerivedAttributes to create a pseudo attribute that depends on another real (or another derived) attribute. This new derived attribute can be accessed under the name given after DerivedAttribute.

  Derived attributes can be used everywhere where real attributes can be used.

`sourceAttribute` `= NAME`
: Give the source attribute to derive the value from.

`defaultValue` `= STRING`
: Provide a default value if no other case fits.

`defaultPathValue` `= FILE`
: Provide a default value if no other case fits. File path specific manipulations may occur to provide the desired result. Only used if defaultValue is not specified.

`Case` `STRING`
: Specify the value to use if the sourceAttribute has the value given after Case.

`value` `= STRING`
: Return this value in this case.

`pathValue` `= FILE`
: Return this value in this case. File path specific manipulations may occur to provide the desired result.

`ComputedAttribute` `NAME`
: Computed attributes are another kind of DerivedAttribute where you can specify an expression instead of a value table.

They can be used everywhere where real attributes can be used.

`expression` `= EXPRESSION`
: Specify the expression to compute. This is basically a field expression, but instead of field names you can use every attribute name of the displayed item model or any DerivedAttribute or ComputedAttribute that has been defined before this one.

Additionally you can use the pseudo attribute "depth" which gives the tree depth of the current item, with top-level items having the depth 1.

`Column` `STRING`
: Add a column to the view. The string given after Column will be used as the header string. If not specified otherwise, it will also be used for for the names of the displayAttribute and editAttribute.

`displayAttribute` `= NAME`
: Specify the name of the attribute to show as the value of this column cell.

You can specify the pseudo-attribute none if you don't want to have text displayed in this column.

`displayAsColor` `= BOOL`
: Specify that the attribute specified in displayAttribute (and editAttribute) should be interpreted as a color and displayed accordingly.

Editing a color is possible and will always produce a string in the format #rrggbb.

`editAttribute` `= NAME`
: Specify the name of the attribute to use when editing a cell value (if this is different from the displayAttribute). Note that the editableAttribute must still be set to enable editing for a column and item.

`editableAttribute` `= NAME`
: Specify the name of the attribute to decide if the column text should be editable. This might override the default given on level of the control.

You can use pseudo attribute names "true/yes" or "false/no" here to enable or disable editing independent from specific items.

`checkboxAttribute` `= NAME`

Specify the name of a bool attribute to display a checkbox in this column.

`checkboxEditableAttribute` `= NAME`

Specify the name of the attribute to decide if the checkbox should be editable. This might override the default given on level of the control.

You can use pseudo attribute names "true/yes" or "false/no" here to enable or disable editing independent from specific items.

`automaticParentCheckboxState` `= BOOL`

Parent items show the cumulative check box state of all their children with check boxes, and may sport a "partially checked" state. (The checkbox is only shown if the checkboxAttribute is defined for the parent item, regardless of its value.)

If there are no direct child items with check boxes in this column, the check box state is determined by the value given through the checkboxAttribute.

`iconAttribute` `= NAME`

Specify the name of a attribute that contains an image or the file path of an image to display a icon in this column.

Note: For many use cases this might be a DerivedAttribute. If a filename is chosen for the icon, then "pathValue" should be set instead of "value" in the derived attribute.

`tooltipAttribute` `= NAME`

Specify the name of a attribute that contains the text that is used to display tooltips in this column.

Note: For many use cases this might be a DerivedAttribute.

`colorAttribute` `= NAME`

Specify the name of a attribute that contains a color or color name to change the text color in this column. This will override the colorAttribute specified on the control level.

Note: For many use cases this might be a DerivedAttribute.

`sortAttributes` `= STRING`

Specify the names of attribute to sort the items by when this column is selected for sorting. Several attributes may be specified (separated by comma) if values of single attributes may be the same. First attribute take precedence over later attributes. Sort order for certain attributes may be inverted by prepending a "!" before the attribute name.

Note: Attributes used for sorting don't necessarily need to be used for display.

`comboboxAttribute` `= NAME`

Specify an attribute that contains the items of a combobox that will be used for editing string values. Use this if you only want to allow certain values while editing. If your list of possible items is static for the whole column, you can define a DerivedAttribute with only a defaultValue and use that.

Note: You still need to set the editableAttribute to allow editing.

Note: An empty list of items will allow free editing.

`comboboxTooltipsAttribute` `= NAME`

Specify an attribute that contains the items of tooltips for the combobox items specified via the comboboxAttribute. will be used for editing string values. If your list of possible items is static for the whole column, you can define a DerivedAttribute with only a defaultValue and use that.

Note: Only useful in combination with comboboxAttribute. Make sure both strings contain the same amount of values.

comboboxItemDelimiter = STRING
: Specify the character (or a whole string) that separates items in the comboboxAttribute and comboboxTooltipsAttribute. The default is the | character.

boldFontAttribute = NAME
: Specify an attribute that evaluates to true or false. If this is true for an item, the displayed text is shown with a bold font.

italicFontAttribute = NAME
: Specify an attribute that evaluates to true or false. If this is true for an item, the displayed text is shown with an italic font.

visibleOn = FIELDEXPRESSION
: Same meaning as with visibleOn tag of a control, but applied on the column.

floatDecimalPlaces = INT
: Specify the number of digits after the decimal point to show for floating-point numbers. -1 means show all (relevant) digits, possibly selecting scientific notation.

automaticResize = BOOL
: Specify if this column should resize automatically if the content of the column changes. This overrides the value given on the control level.

align = BOOL
: Specify the alignment of text in this column. Possible values are Left, Right or Center. This overrides the value given on the control level.

headerAlign = BOOL
: Specify the alignment of text in the header of this column. Possible values are Left, Right or Center. This overrides the value given on the control level.

For detailed examples, have a look at the **FileSystemItemModelData** and **FileSystemItemModelView** modules which demonstrate some of the possibilities of this control. This example is taken from FileSystemItemModelView:

```
ItemModelView input {
  selectionField  = selection
  idAttribute     = name
  idAsFullPath    = true
  idPathSeparator = "/"
  idSeparator     = ";"
  sortByColumn    = 0

  DerivedAttribute "icon" {
    sourceAttribute = directory
    case "1" {
      pathValue = "$(MLAB_MeVisLab_IDE)/Modules/IDE/images/fileopen.png"
    }
  }

  Column "name" {
    sortAttributes = "!directory,name_nocase"
    iconAttribute = icon
  }
  Column "size" {
    align = right
  }
  Column "writable" {
    displayAttribute = none
    checkBoxAttribute = writable
    checkBoxEditableAttribute = true
  }
}
```

Also have a look at MLStandardItemModelWrapper for a way to generate your own item model from scripting.

ItemModelView is derived from Control.

4.8. Event Handling Controls

4.8.1. Accel

Accel allows to add keyboard shortcuts that trigger fields or execute a Python command when pressed. They are local to the window they are declared in, thus they are only triggered when their parent window is active.

Accel can appear inside of all Group GUI controls. The field and command tags are both optional. Note that Accel should be stated before the other GUI controls for which the defined shortcuts should be available. I.e., if a certain shortcut should be available for a whole window, state the according Accel statement right at the beginning, just after the Window statement.

Dynamic scripting: MLABAccelControl

```
Accel {
  key     = KEYSEQUENCE
  field   = FIELD
  command = SCRIPT
}
```

key = KEYSEQUENCE
: defines a shortcut that triggers the accelerator, e.g., CTRL+X, ALT+Z, CTRL+SHIFT+U.

field = FIELD
: defines a trigger field that is touched when the keyboard shortcut is pressed.

command = SCRIPT
: defines a script command that is called when the keyboard shortcut is pressed.

4.8.2. EventFilter

The EventFilter is a non-GUI control that can be placed anywhere in the GUI. It allows to listen to the events that other controls (and optionally their children) receive and can then either prevent the event from being delivered or just pass through the event. It is a very powerful control since it allows to react on GUI events on a low level. You can, e.g., use it to teach other controls drag-and-drop features, to notice when a window gets visible/hidden or when a control gets entered with the mouse and much more.

Dynamic scripting: MLABEventFilterControl

```
EventFilter {
  name     = NAME
  command  = SCRIPT
  filter   = NAMELIST
  eatEvent = BOOL          [No]
  children = BOOL          [No]
  debug    = BOOL          [No]
  control  = NAME
  ...
}
```

name = NAME
: sets the name of the EventFilter, for usage with ctx.control() method.

command = SCRIPT (arguments: eventPropertyMap [, control, QEvent])
: defines a script command that is called for each event that matched the filter. For details on the event properties, see below. The optional control parameter can be used to directly access the EventFilter control. The optional QEvent parameter allows to directly access the Qt event for advanced usage. Make sure to import PythonQt.QtGui in your Python code if you want to access the QEvent directly.

filter = NAMELIST
: a list of event names that should be filtered.

eatEvent = BOOL (default: No)
: sets whether the filtered events are eaten automatically (=not delivered).

children = BOOL (default: No)
: sets whether the filter is applied to all subwidgets or just to the given controls.

debug = BOOL (default: No)
: sets whether all events are printed to the console (just to see which events happen and which you might be interested in).

control = NAME
: sets the name of the control to filter events on. This tag can appear multiple times so that the filter listens to multiple controls at a time.

The filter can contain a number of Event names. These names are take from Qt. You can find the event details at http://doc.qt.io/qt-5/qevent.html.

All events share the *type* property, which can be checked if multiple events are filtered. To print all properties of an event, just print the passed event property map in Python.

The most useful events are:

`MouseButtonPress, MouseButtonRelease, MouseButtonDblClick, MouseMove`
: react on mouse button press or release and movement.

  Event properties: x, y, globalX, globalY, button (one of "left","mid","right"), ctrlKey, shiftKey, altKey

`Show, Hide`
: reacts on a control being shown or hidden.

  Event properties: none (except type)

`Enter, Leave`
: reacts on mouse entering or leaving the control area.

  Event properties: none (except type)

`DragEnter, DragMove, Drop`
: handles drag-and-drop on a low level.

  Event properties: x, y, globalX, globalY

`Wheel`
: handles the mouse wheel event.

  Event properties: x, y, globalX, globalY, delta, orientation (one of "vertical","horizontal"), ctrlKey, shiftKey, altKey

`Resize`
: handles resize event.

  Event properties: width, height, oldWidth, oldHeight

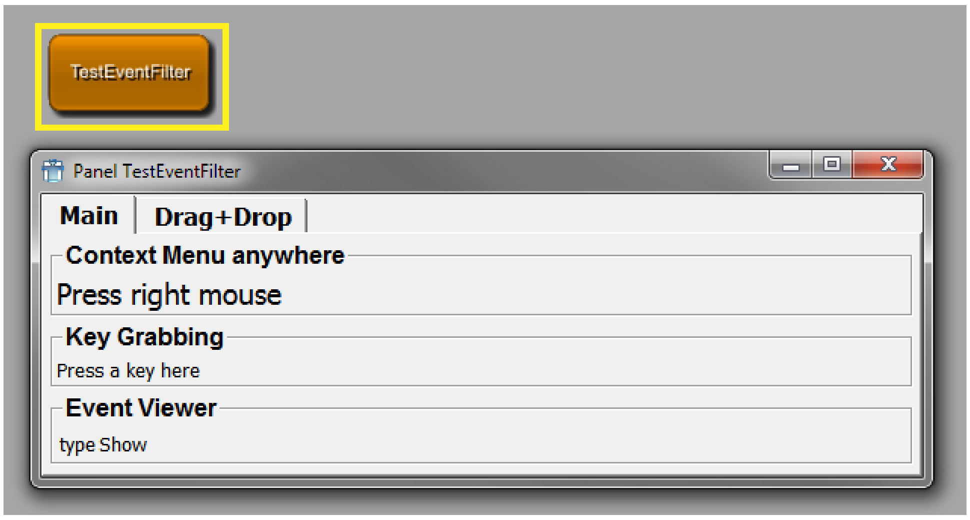
`KeyPress, KeyRelease`
: handles the key press event, where "ascii" is the ascii char, the text is unicode and the key can be used to access special keys, e.g., "Left", "Right" for cursor keys. See the Qt key defines or have a look at the example in TestEventFilter.

  Event properties: ascii, text, key, ctrlKey, shiftKey, altKey

Example 4.29. EventFilter

Have a look at the module **TestEventFilter**. This module features the reacting of certain areas of the GUI on defined mouse actions (button pressed, entered/leave, etc.) and the implementation of dragging and dropping of files or images.

Figure 4.20. TestEventFilter Module



4.9. Other Design Options

This chapter explains other options used in many GUI controls: the layout engine, rich text, and the MDL styles.

4.9.1. Align Groups

By default, various GUI Controls are laid out depending on each other, e.g., Field controls in a Vertical automatically get the same label size. This behavior can explicitly be specified by the concept of "Align Groups". A group is specified by its unique name, which you have to choose. All controls which are in the same group are aligned in respect to the type of the group.

There are three type of groups (given by their tag names):

- **alignGroupX** (alias: **alignGroup)** - all child widgets of the control get the maximum width of all child widgets in that column.
- **alignGroupY** - all child widgets of the controls get the maximum height of all child widgets in that row.
- **labelAlignGroup** - all controls get the same maximum label size.

In simpler words: if two controls, e.g., Fields in the same Vertical, have the same **alignGroup** tag, all the subwidgets in the Field controls are aligned well in their widths.

The labelAlignGroup can be used to just align the labels, so that the other children of a Control will not be aligned. Have a look at the `TestLayouter` MacroModule in MeVisLab, which shows the differences.

Important

Please note that the term "alignment" in this section might be misleading. In this context, alignment means getting the same width or height as another control. This does not necessarily mean a visual alignment, since the controls may be located at completely different positions. Also note that the alignment is a one-time process when the window is created, so it might get unaligned if you allow expanding of the controls via **expandX, expandY**.

In addition to the above tags, which are used directly inside of a control that should be aligned, you can also use the **childAlignGroupX** (alias **childAlignGroup**) and **childAlignGroupY** tags, which can be specified in any control that has children. This causes all "simple" controls inside this control to get the specified align group. So you can just see it as a helper tag that helps you write less tags:

```
Vertical {
  childAlignGroup = group1
  Box {
    Field test1 { }
    Field test2 { }
  }
  Box {
    Field test3 { }
    Field test4 { }
  }
}
```

This is identical to the following, note that the boxes do not get the alignGroup and that the childAlignGroup tag works recursively.

```
Vertical {
  Box {
    Field test1 { alignGroup = group1 }
    Field test2 { alignGroup = group1 }
  }
  Box {
    Field test3 { alignGroup = group1 }
    Field test4 { alignGroup = group1 }
  }
}
```

The labelAlignGroup tag can also be used at a higher level and it causes all "simple" controls to get their labels aligned. See the `TestLayouter` MacroModule in MeVisLab for an example of the above tags.

4.9.2. RichText

The following tabels give you an overview of which tags are available in RichText. The RichText can be used in tooltips, whatsthis boxes, Label, HyperText, HyperLabel and various other places. The syntax is a simple subset of HTML, including lists, tables, images and links. Have a look at the `TestHyperText` module in MeVisLab to see some examples.

Table tags	**Notes**
`<table>...</table>`	A table. Tables support the following attributes: • `bgcolor` -- The background color. • `width` -- The table width. This is either an absolute pixel width or a relative percentage of the table's width, for example `width=80%`. • `border` -- The width of the table border. The default is 0 (= no border). • `cellspacing` -- Additional space around the table cells. The default is 2. • `cellpadding` -- Additional space around the contents of table cells. The default is 1.
`<tr>...</tr>`	A table row. This is only valid within a table. Rows support the following attribute: • `bgcolor` -- The background color.
`<th>...</th>`	A table header cell. Similar to `td`, but defaults to center alignment and a bold font.

Table tags	Notes
`<td>...</td>`	A table data cell. This is only valid within a table row. Cells support the following attributes: • `bgcolor` -- The background color. • `width` -- The cell width. This is either an absolute pixel width or a relative percentage of table's width, for example `width=50%`. • `colspan` -- Specifies how many columns this cell spans. The default is 1. • `rowspan` -- Specifies how many rows this cell spans. The default is 1. • `align` -- Alignment; possible values are `left`, `right`, and `center`. The default is `left`. • `valign` -- Vertical alignment; possible values are `Top`, `Middle` and `Bottom`. The default is `Middle`.

Special tags	Notes
`<img>`	An image. The image name for the mime source factory is given in the source attribute, for example `<img src="qt.xpm">`. The image tag also understands the attributes width and height that determine the size of the image. If the pixmap does not fit the specified size it will be scaled automatically The align attribute determines where the image is placed. By default, an image is placed inline just like a normal character. Specify left or right to place the image at the respective side.
`<hr>`	A horizontal line.
`<br>`	A line break.
`<nobr>...</nobr>`	No break. Prevents word wrap.

Style tags	Notes
`<em>...</em>`	Emphasized. By default this is the same as `<i>...</i>` (italic).
`<strong>...</strong>`	Strong. By default this is the same as `<b>...</b>` (bold).
`<i>...</i>`	Italic font style.
`<b>...</b>`	Bold font style.
`<u>...</u>`	Underlined font style.
`<s>...</s>`	Strike out font style.
`<big>...</big>`	A larger font size.
`<small>...</small>`	A smaller font size.
`<code>...</code>`	Indicates code. By default this is the same as `<tt>...</tt>` (typewriter). For larger chunks of code, use the block-tag `<pre>`.
`<tt>...</tt>`	Typewriter font style.
`<font>...</font>`	Customize the font size, family and text color. The tag can have the following attributes: • `color` -- The text color, for example `color="red"` or `color="#FF0000"`. • `size` -- The logical size of the font. Logical sizes 1 to 7 are supported. The value may either be absolute (for example, `size=3`) or relative (`size=-2`). In the latter case the sizes are simply added. • `face` -- The family of the font, for example `face="times"`.

Anchor tags	Notes
`<a>...</a>`	An anchor or link. • A link is created by using an href attribute, for example `<a href="target.qml">Link  Text</a>`. Links to targets within a document are written in the same way as for HTML, e.g., `<a href="target.qml#subtitle">Link Text</a>`. • A target is created by using a name attribute, for example `9<a name="subtitle"><h2>Sub Title</h2></a>`.

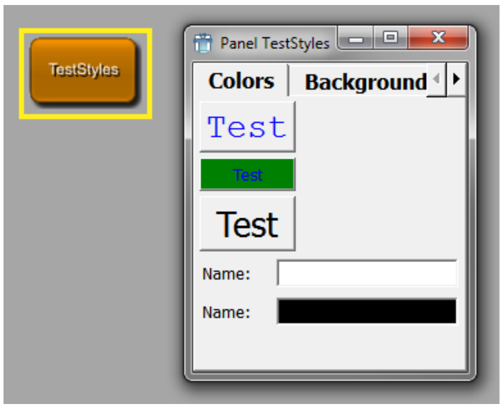
Structuring tags	Notes
`<qt>...</qt>`	A Qt rich text document. It can have the following attributes: • `title` -- The caption of the document. • `type` -- The type of the document. The default type is `"page"`. It indicates that the document is displayed in a page of its own. Another style is `"detail"`, which can be used to explain certain expressions in more detail in a few sentences. Note that links will not work in documents with `<qt type="detail">...</qt>`. • `bgcolor` -- The background color, for example `bgcolor="yellow"` or `bgcolor="#0000FF"`. • `background` -- The background pixmap, for example `background="granite.xpm"`. The pixmap name needs to have an absolute path, e.g., use `$(LOCAL)/image.png`. • `text` -- The default text color, for example `text="red"`. • `link` -- The link color, for example `link="green"`.
`<h1>...</h1>`	A top-level heading.
`<h2>...</h2>`	A sublevel heading.
`<h3>...</h3>`	A sub-sublevel heading.
`<p>...</p>`	A left-aligned paragraph. Adjust the alignment with the align attribute. Possible values are `left`, `right` and `center`.
`<center>...</center>`	A centered paragraph.
`<blockquote>...</blockquote>`	An indented paragraph that is useful for quotes.
`<ul>...</ul>`	An unordered list. You can also pass a type argument to define the bullet style. The default is `type="disc"`; other types are `circle` and `square`.
`<ol>...</ol>`	An ordered list. You can also pass a type argument to define the enumeration label style. The default is `type="1"`; other types are `"a"` and `"A"`.
`<li>...</li>`	A list item. This tag can be used only within the context of `<ol>` or `<ul>`.
`<pre>...</pre>`	For larger chunks of code. Whitespaces in the contents are preserved. For small bits of code, use the inline-style code.

4.9.3. Styles

Styles can be defined globally but also locally in a user interface to change the GUI appearance. Every control supports the `style` tag, where you can give a style by its name (declared with DefineStyle) or by just opening a local style and deriving from the current style.

Example: See **TestStyles** macro module in MeVisLab.

Figure 4.21. TestStyles Module



4.9.3.1. DefineStyle

DefineStyle allows to define a new GUI style, either complete or just extending an existing style. The style provided with MeVisLab is called "default". Old ILAB4 styles are also supported, being defaultVerySmall, defaultSmall, defaultBig, defaultHuge. These styles should no longer be used and are replaced by the **scale** tag, with which you can resize all fonts in a GUI control by just giving the scale tag and a positive or negative integer for bigger/smaller fonts and spacings.

Styles can be used to change the whole user interface appearance or just to change a single color/font in a given control. See below for an example on how to do that.

A style contains Fonts, Colors and Prototypes. You can specify a different font for each of the following roles:

- Titles (titleFont tag)
- Editable text (editFont tag)
- TabBar text (tabFont tag)
- Box group titles (boxFont tag)

There are two different sets of colors, the default `colors` and the `disabledColors` specifies which colors a control uses when it is drawn. The disabledColors are used when a control is not enabled (also called "grayed out").

```
DefineStyle NAME {
   derive = NAME

   // font for titles in the GUI (Buttons, Labels, etc.)
   titleFont {
     family     = NAME
     size       = INT
     weight     = ENUM
     italic     = BOOL
     fixedPitch = BOOL
   }

   // font for editing components in the GUI (NumberEdit, TextView, ...)
   editFont {
     // see titleFont
   }

   // font for TabViews
   tabFont {
     // see titleFont
   }
   // font for Box group titles
   boxFont {
     // see titleFont
   }

   colors {
     fg              = COLOR
     bg              = COLOR
     button          = COLOR
     buttonText      = COLOR
     editText        = COLOR
     editBg          = COLOR
     base            = COLOR
     alternateBase   = COLOR
     light           = COLOR
     midlight        = COLOR
     dark            = COLOR
     mid             = COLOR
     shadow          = COLOR
     highlight       = COLOR
     highlightedText = COLOR
     brightText      = COLOR
     link            = COLOR
     linkVisited     = COLOR
     boxText         = COLOR
     tabText         = COLOR
     toolTipBase     = COLOR
     toolTipText     = COLOR
   }
   disabledColors {
     // same as above colors
   }
}
```

`derive` `= NAME`
select a style to derive from, all attributes are copied and you may overwrite any of the tags, e.g., just the font sizes, an individual color.

`titleFont`, **`editFont`**, **`boxFont`**, **`tabFont`**
defines properties of a font (you do not need to specify all tags, reasonable defaults are taken from the underlying system settings.

`family` `= NAME`
specify a font family name; possible names are: Helvetica, Courier, etc.

`size` `= INT`
set the point size of the font.

`weight` `= ENUM`
set the weight of the font.

Possible values: Light, Normal, DemiBold, Bold, Black

`italic` `= BOOL`
set if font should be italic.

`fixedPitch` `= BOOL`
set if the font should be fixed pitch (depends on font family).

`colors, disabledColors`
define the normal colors and the disabled colors for all controls in this style.

The syntax for COLOR in the style is:

colorname[:imagefilename]

where colorname can be one of:

- #rrggbb

- X11 color name (also on Windows)
- name specified in Colors section

and imagefilename can be an extra image used as brush for that color. Using images is especially interesting for the background colors bg, editBg and button.

Examples:

```
bg = black:$(LOCAL)/someBackgroundImage.png

editBg = white
```

fg = COLOR
: foregound text color used in Labels etc.

  Aliases: foreground, windowText

bg = COLOR
: background color.

  Aliases: background, window

button = COLOR
: background color of buttons.

buttonText = COLOR
: text color on buttons.

editText = COLOR**editBg** = COLOR
: color for editable text and background for text edits and list views.

base = COLOR
: same as editBg.

alternateBase = COLOR
: defines the alternate background color for ItemModelViews that have the alternatingRowColors attribute set.

light = COLOR **midlight** = COLOR **dark** = COLOR **mid** = COLOR **shadow** = COLOR
: colors used for drawing sunken and raised panels and buttons.

highlight = COLOR **highlightedText** = COLOR
: highlight background and text color, e.g., for text selection and ListViews.

brightText = COLOR
: text with good contrast to "dark" color.

link = COLOR **linkVisited** = COLOR
: color used for drawing links and visited links (in RichText).

boxText = COLOR
: color of box titles.

tabColor = COLOR
: color of TabBar titles.

toolTipBase = COLOR**toolTipText** = COLOR
: background and text color of tool tips.

Chapter 5. Translations

MeVisLab supports translations by using the internationalization framework of Qt.

Modules that use translations must have the tag hasTranslation set to true. The languages for the translations must be declared using the translationLanguages tag. It is also possible to provide the names of other modules that will also be translated: translationModules.

Strings to translate are taken from MDL tags and from occurrences of ctx.translate() in Python scripts of the translated modules (please only use direct strings as argument for ctx.translate, no expressions or variables). Panels of other modules that are incorporated into the GUI of referenced modules through the Panel control will also automatically be searched for translatable strings.

After changing the MDL scripts and Python code, it is necessary to create the translation files (*.ts). This is done from the context menu of the MeVisLab module: **Translations** → **Create/Update**. The translation files can then be edited with the Qt Linguist tool which is available through **Translations** → **Edit**.

The translation files must be compiled into run-time translation files (*.qm) before they can be used. This can be done with the Qt Linguist tool from the main menu: **File** → **Release**. This step is not necessary when building standalone applications, because MeVisLab will then automatically compile the *.ts files to *.qm files. The *.qm files will be included in the installer.

Usually the operating system localization will determine which language is chosen. To force MeVisLab to select a different language, it is possible to provide the preferences variable `Locale`, e.g., to en_EN. For testing this can also be achieved by selecting **Translations** → **Set Language And Reload** and then selecting the desired language value.

Chapter 6. Test Cases

The MDL syntax for defining test cases is explained in the Test Center Reference.

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