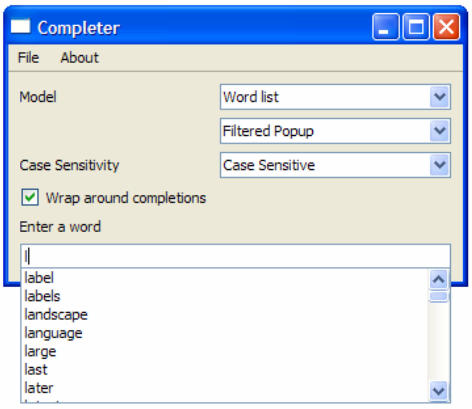
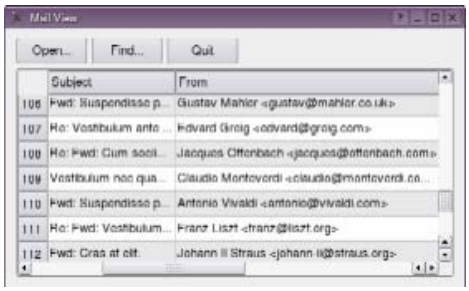
Comprehension Questions

Questions on the Qt system	Diagrams Shown [1]
1. What is the class stereotype assigned to *QSqlDatabase*?	qt-D1 qt-D2
2. Which classes are dependent on *QPainter*?	qt-G1 qt-G2
3. Is this statement true or false? The control class *QDragManager* is associated with the entity class *QPixmap* via the attribute *pm_cursor*.	qt-I1 qt-I2
4. Which class is involved in a composition relationship with *QAction* and is part of the *QEvent* hierarchy?	qt-E1 qt-E2
5. Qt's model/view architecture makes it possible to display the same data in different ways without changing the underlying data structure, delivering flexibility and scalability to large data sets. Which concrete class (or classes) implement the view component in the model/view architecture? Select all that apply.	qt-MV1 qt-MV2
6. Select the class responsible for setting the central widget of a window.	qt-MW1 qt-MW2
7. Which abstract class is responsible for managing layout for the graphical user interface?	qt-L1 qt-L2
8. A view renders the contents of a model. You need to use a model with QListView. Which class would you use to represent the model?	qt-MV1 qt-MV2
9. SVG is an XML-based file format and language for describing 2 dimensional graphics. Which class controls the drawing of SVG files to a paint device?	qt-G1 qt-G2
10. Which class provides an action that can be inserted into widgets?	qt-W1 qt-W2
11. Which concrete layout related classes and widget related classes are used in the Dialog box below?	qt-L1 qt-L2

[1] One of the two diagrams were shown for each question. The first one is in multi-cluster layout, the second is in orthogonal layout

Select all layout related concrete classes and widget related concrete classes that apply.  	
12. Which input event class stores information about which key on the keyboard was pressed?	qt-E1 qt-E2
13. Qt allows data obtained from models to be related to specific widgets. Which class is responsible for setting up this data relation between SQL models and widgets?	qt-D1 qt-D2

14. Consider the Analog clock QT application shown below. The main program is shown below.
 	
`#include < QApplication >`
`#include "analogclock.h"`
`int main(int argc, char *argv[]) {`
`  QApplication app(argc, argv);`
`  AnalogClock clock;`
`  clock.show();`
`  return app.exec();`
 
 	
We would like to add a 'second' hand to the clock. Which method does this change impact?
	qt-MW1
	qt-MW2

15. You need to add an auto completion facility to QT that provides completions to words entered into a line textbox or combobox widget. The completions are based on an item model. See the figure below for an example of the completer in action. You decide that the best way to do this is to create a new class *QCompleter* that provides this functionality. Which widget classes need to change (i.e., add methods or variables) if *QCompleter* is added to QT? Which class should *QCompleter* inherit from? 	qt-W1 qt-W2
16. A view may be populated with data from any model such as a table or directory model. One such example of a view is shown below. Notice how the rows have an alternating background color to them. In order to implement this functionality, you need to add a method with the following signature. `void setAlternatingRowColors(bool enable)`  Which class would you add this method to?	qt-MV1 qt-MV2

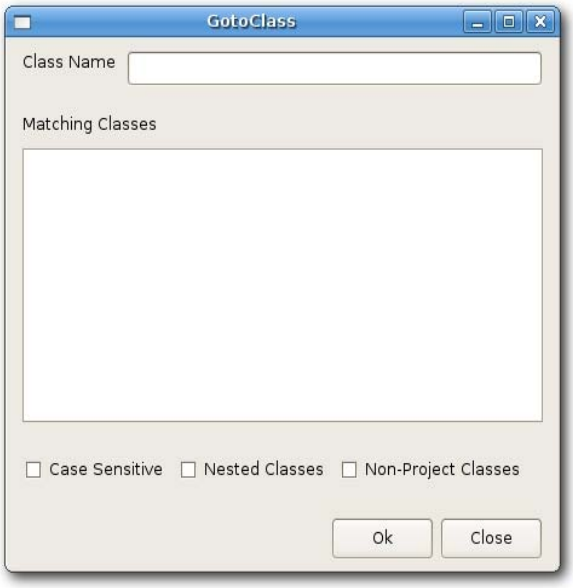
17. You are given the following bug description: ---------- Bug Title: Change foreground color of checkboxes inside tables Bug Description: When a checkbox is displayed in a table and the row is highlighted, the checkbox rectangle should be drawn with the same color as the text in the cell. ---------- Which class (or classes) will most likely need to be changed in order to fix this bug?	qt-W1 qt-W2
18. You need to extend Qt's functionality to include an image plugin to read and write images using an new image format you invented. Which class do you need to subclass for this plugin?	qt-I1 qt-I2
19. Syntax Highlighting is the use of appropriate fonts and colors to highlight different elements in a document. You need to create a new class CodeHighlighter that adds syntax highlighting to the *QTextEdit* widget. *QTextEdit* is used to edit and display both plain and rich text. a) Which abstract class would you derive *CodeHighlighter* from? b) Which method would *CodeHighlighter* need to reimplement from the abstract class? c) You will need to instantiate *CodeHighlighter* with *QTextEdit's* underlying *QTextDocument* as the parent. Which method in *QTextEdit* returns a text document?	qt-W1 qt-W2
20. OpenGL is a standard API for rendering 3D graphics. To use OpenGL-enabled widgets in a Qt application, which class do you need to subclass?	qt-G1 qt-G2
21. You need to improve the design of the module shown in the following diagram and remove some redundancy. Which method will most probably need to be defined in *QIODevice* from it's subclasses? (Note that the method can still be reimplemented in *QIODevice* subclasses as	qt-I1 qt-I2

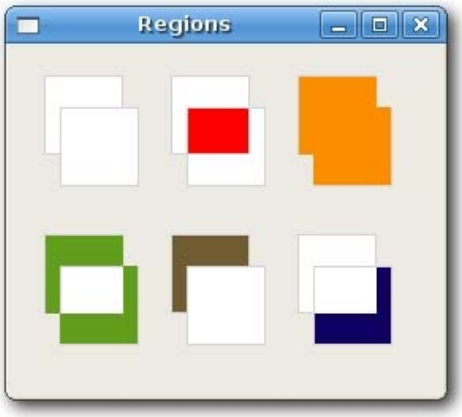
needed.) Should this field be private, public or protected?	

22. The class *QHBox* provides horizontal geometry management for its child widgets. All the horizontal box's child widgets are placed alongside each other and sized accordingly. See the following example of *QHBox* in action.
 
 	
Now consider the following code fragments.
 	
Code Fragment 1
`QHBox *hbox = new QHBox;`
`QPushButton *child1 = new PushButton(hbox);`
`QPushButton *child2 = new PushButton(hbox);`
Code Fragment 2
`QWidget *hbox = new QWidget;`
`QPushButton *child1 = new QPushButton;`
`QPushButton *child2 = new QPushButton;`
 	
`QHBoxLayout *layout = new QHBoxLayout;`
`layout->addWidget(child1);`
`layout->addWidget(child2);`
`hbox->setLayout(layout);`
a) True or False: Code Fragment 1 and Code Fragment 2 are equivalent. In other words, when executed, they produce the same result.
b) True or False: *QHBox* can be removed without causing any code to break. Base your answer on information given in the diagram.
c) True or False: *QHBoxLayout* can be removed without causing any code to break. Base your answer on information given in the diagram.
	qt-L1
	qt-L2

Questions on the wxWidgets System	Diagrams Shown [2]
1. What is the class stereotype assigned to *wxDbTableInf*?	wx-D1 wx -D2
2. Which classes are dependent on *wxRect*?	wx-G1 wx-G2
3. Is this statement true or false? The boundary class *wxDC* is associated with the entity class *wxBitmap* via the attribute *m_selectedBitmap*.	wx-I1 wx-I2
4. Which class is involved in an aggregation relationship with *wxObject* and is also associated with *wxHashTable*?	wx-E1 wx-E2
5. wxWidget's document/view architecture lets you model your application primarily in terms of documents, which store data and views, which display and manipulate the data. Which concrete class (or classes) implement the *document* component in the document/view architecture?	wx-DV1 wx-DV2
6. Splash screen is a term used to describe an image that appears while a computer program is loading. Splash screens sometimes do not cover the entire screen, but only a rectangle near the center. Select the class responsible for setting the image/bitmap for the splash screen.	wx-MW1 wx-MW2
7. Which abstract boundary class is responsible for managing layout for the graphical user interface?	wx-L1 wx-L2
8. Which class models the relationship between a document class and a view class?	wx-DV1 wx-DV2
9. SVG is an XML-based file format and language for describing 2 dimensional graphics. Which class acts as an input handler for the SVG file format?	wx-G1 wx-G2
10. Which class provides a control that models hierarchical data?	wx-W1 wx-W2

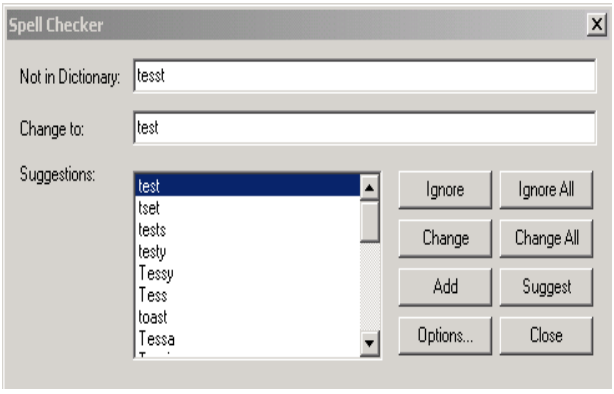
[2] One of the two diagrams were shown for each question. The first one is in multi-cluster layout, the second is in orthogonal layout

11. Which concrete layout related classes and widget related classes are used in the Dialog box below? Select all layout related concrete classes and widget related concrete classes that apply.  	wx-L1 wx-L2
12. Which command event class is used to give an application the chance to update various user interface elements?	wx-E1 wx-E2
13. Which class lets you view information from a database table in a grid?	wx-D1 wx-D2
14. Consider the Regions wxWidgets application shown below. The orange filled squares in the first row and third column of the 'Regions' frame window need to be changed to blue. Which method does this change impact?	wx-MW1 wx-MW2

	
15. You need to add undo/redo functionality to commands which are actions usually performed by selecting a control such as a menu item, pressing a button or any other means provided by the application to change the data or view. Which classes need to change (i.e., add methods or attributes) if undo/redo is to be implemented?	wx-W1 wx-W2
16. You need to add a method to the document/view component that returns a reference to the list of documents. The signature of the method to be added is `wxList& GetDocuments()` Which class would you add this method to?	wx-DV1 wx-DV2

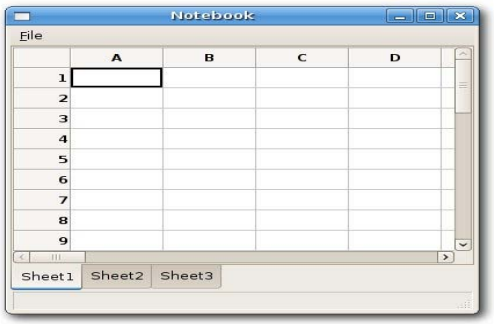
17. You are given the following bug description:
---------- 	
Bug Title: SetForegroundColour doesn't update the control.
Bug Description:
wxStaticText::SetForegroundColour does not update the control to change the colour. The following code does not work after the control has been created.
`bool set_to_red;`
`wxStaticText *t;`
`t->SetForegroundColour(set_to_red ? wxColour("RED") : wxColour("GREEN"));`
---------- 	
Which class (or classes) will most likely need to be changed in order to fix this bug?
	wx-W1
	wx-W2

18. You need to extend wxWidget's functionality	wx-I1

to include an image handler to read and write images using an new image format you invented. Which class do you need to subclass to support this new format?	wx-I2
19. wxSpellChecker is a generic spell-check component that can use different spell checking engines. You need to add engine interface support for the GNU 'Aspell' engine. A new class called *AspellInterface* needs to be created. a) Which class would you derive *AspellInterface* from? b) Which method would need to be reimplemented in *AspellInterface* from the base class? c) You also need to add a dialog interface to your spellchecker similar to the one shown below. A new class *MySpellingDialog* needs to be created. Which class would you derive *MySpellingDialog* from?  Example showing spellchecker in action	wx-W1 wx-W2
20. OpenGL is a standard API for rendering 3D graphics. Which class do you need to subclass to create an OpenGL enabled window?	wx-G1 wx-G2
21. You need to improve the design of the module shown in the following diagram and remove some redundancy. Which attribute (field) will most probably need to be defined in *wxDC* from it's subclasses? Should this field be private, public or	wx-I1 wx-I2

protected?

23. Sizers are used to define layout of controls in dialogs. *wxNotebookSizer* is a specialized sizer to make sizers work in connection with using notebooks. This sizer is different from any other sizer as you must not add any children to it - instead, it queries the notebook class itself. The only thing this sizer does is to determine the size of the biggest page of the notebook and report an adjusted minimal size. An example of a notebook control is shown below.



Now consider the following code fragments.

Code Fragment 1

```
f=wxFrame()
mainsizer=wxBoxSizer(wxVERTICAL)
f.SetSizer(mainsizer)

notebook=wxNotebook()
notesizer =
wxNotebookSizer(notebook)
mainsizer.Add(notesizer)
```

Code Fragment 2

```
f=wxFrame()
mainsizer=wxBoxSizer(wxVERTICAL)
f.SetSizer(mainsizer)

notebook=wxNotebook()
notesizer = wxBoxSizer(notebook)
mainsizer.Add(notesizer)
```

a) True or False: Code Fragment 1 and Code Fragment 2 are equivalent. In other words, when executed, they produce the same result.
b) True or False: *wxNoteBookSizer* can be removed without causing any code to break. Base your answer on information given in the diagram.
c) True or False: *wxBoxSizer* can be removed without causing any code to break. Base your answer on information given in the diagram.

wx-L1
wx-L2

Preference Ratings

For preference ratings, the following template was used for each question for the 6 experts and for two of the questions in qt and wxWidgets for the main study.

Comprehension Rating	**Very Useful**	**Somewhat Useful**	**Don't know**	**Somewhat Useless**	**Completely Useless**
<system>-<module>1					
<system>-<module>2					
<system>-<module>3					

Aesthetic Rating	**Very Appealing**	**Somewhat Appealing**	**Don't know**	**Somewhat Unappealing**	**Very Unappealing**
<system>-<module>1					
<system>-<module>2					
<system>-<module>3					

Comments on your comprehension and aesthetic rating:

Best and Worst Aesthetics Ranking-qt

For each Diagram triplet, enter the diagram ID with the best and worst aesthetics. For your convenience, each triplet is shown on one page in thumbnail form and is also available in full size.

Diagrams (IDs)	Diagram with the Best Aesthetics	Diagram with the Worst Aesthetics	Comments
qt-D1 qt-D2 qt-D3			
qt-E1 qt-E2 qt-E3			
qt-MV1 qt-MV2 qt-MV3			
qt-G1 qt-G2 qt-G3			
qt-I1 qt-I2 qt-I3			
qt-L1 qt-L2 qt-L3			
qt-MW1 qt-MW2 qt-MW3			
qt-W1 qt-W2 qt-W3			

Comments about this questionnaire:

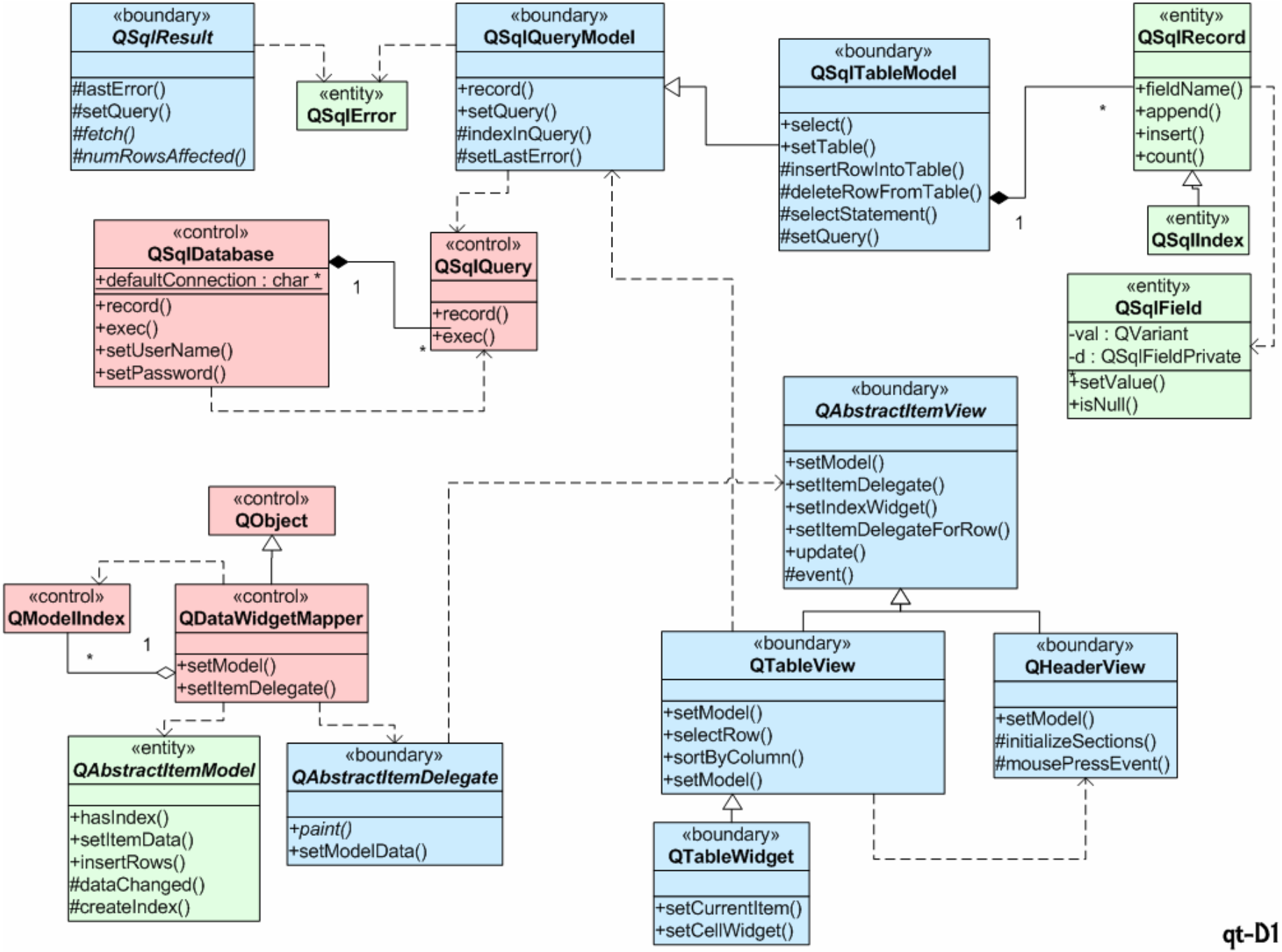
Best and Worst Aesthetics Ranking -wxWidgets

For each Diagram triplet, enter the diagram ID with the best and worst aesthetics. For your convenience, each triplet is shown on one page in thumbnail form and is also available in full size.

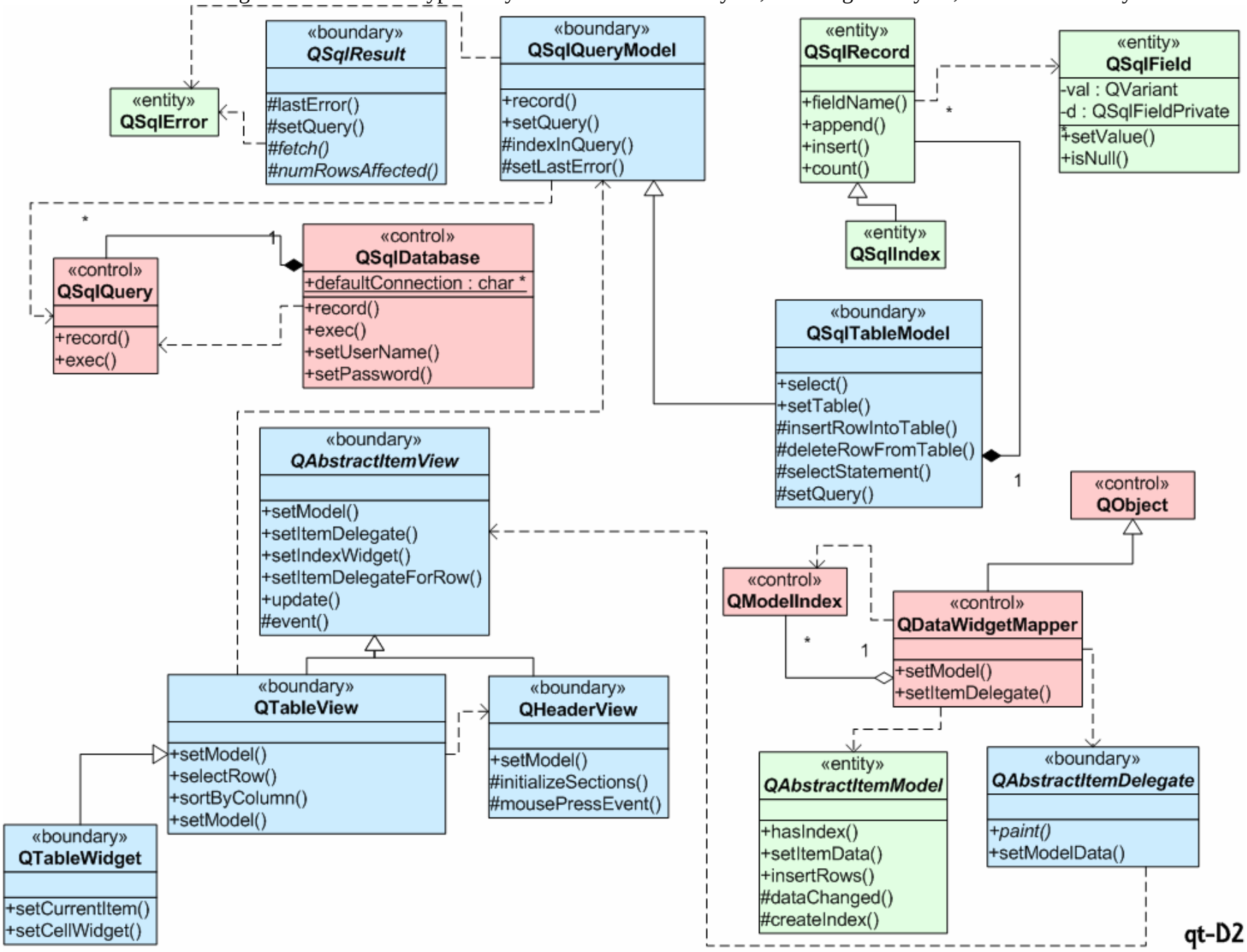
Diagrams (IDs)	Diagram with the Best Aesthetics	Diagram with the Worst Aesthetics	Comments
wx-D1 **wx-D2** **wx-D3**			
wx-E1 **wx-E2** **wx-E3**			
wx-DV1 **wx-DV2** **wx-DV3**			
wx-G1 **wx-G2** **wx-G3**			
wx-I1 **wx-I2** **wx-I3**			
wx-L1 **wx-L2** **wx-L3**			
wx-MW1 **wx-MW2** **wx-MW3**			
wx-W1 **wx-W2** **wx-W3**			

Comments about this questionnaire:

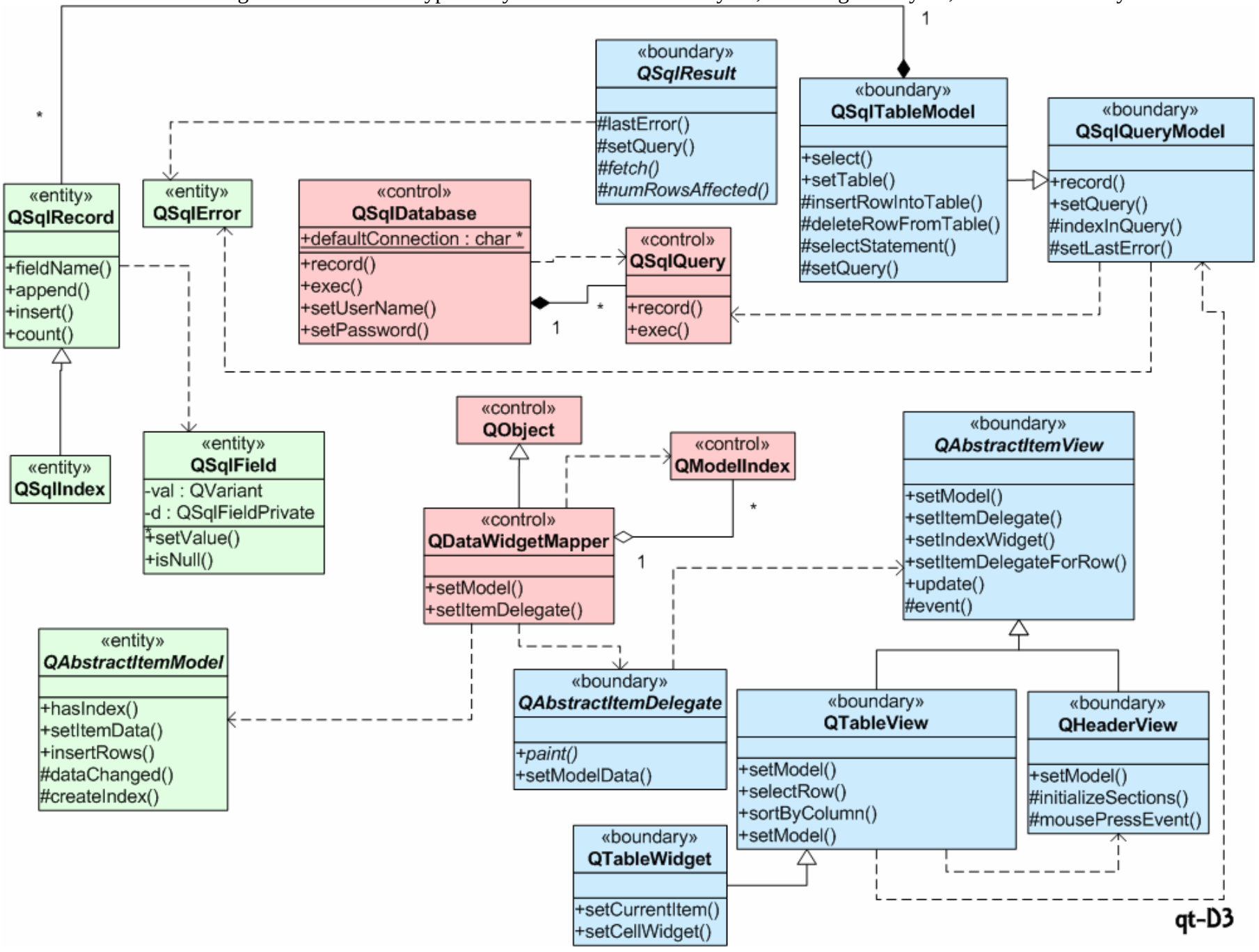
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



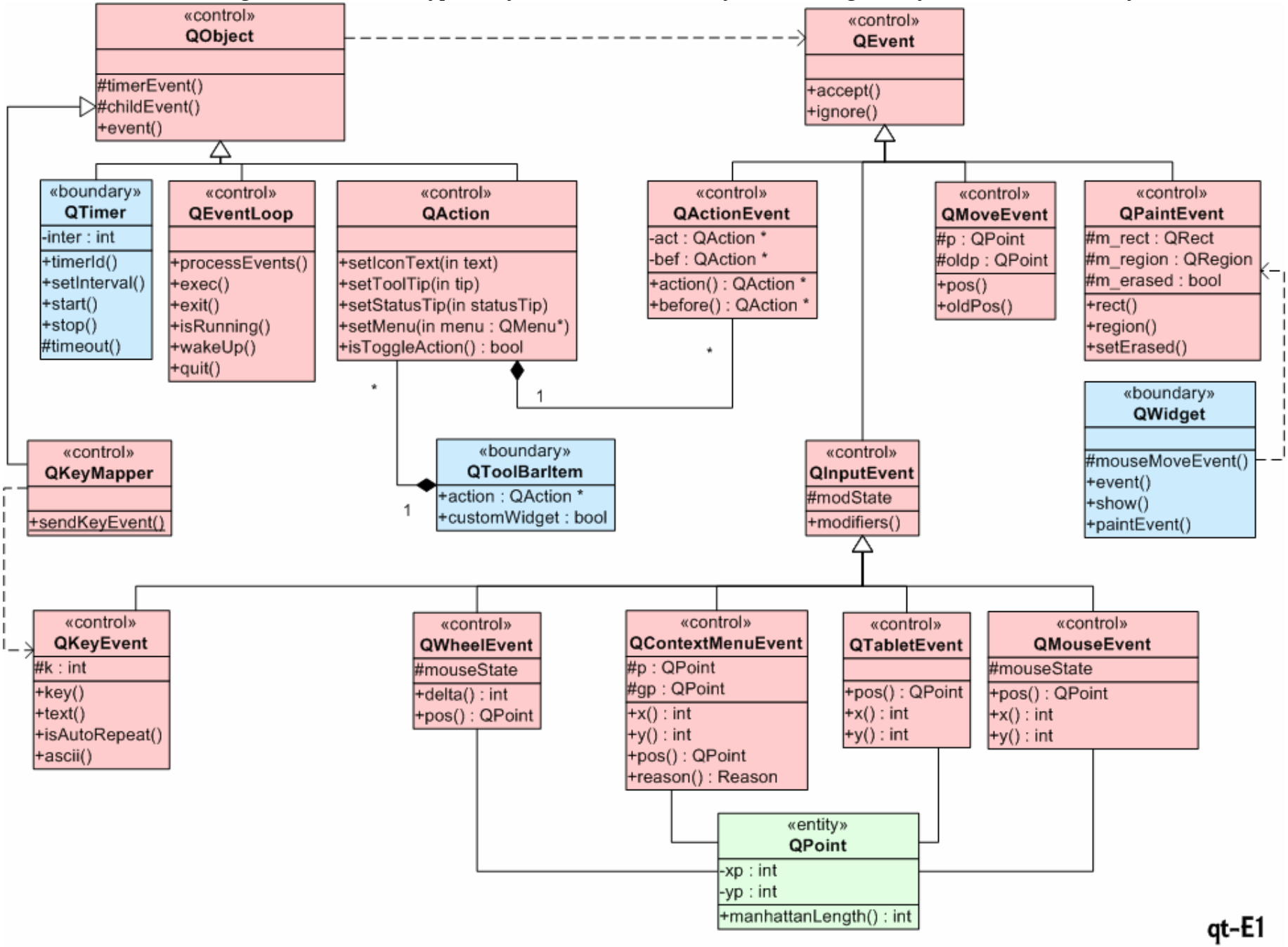
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



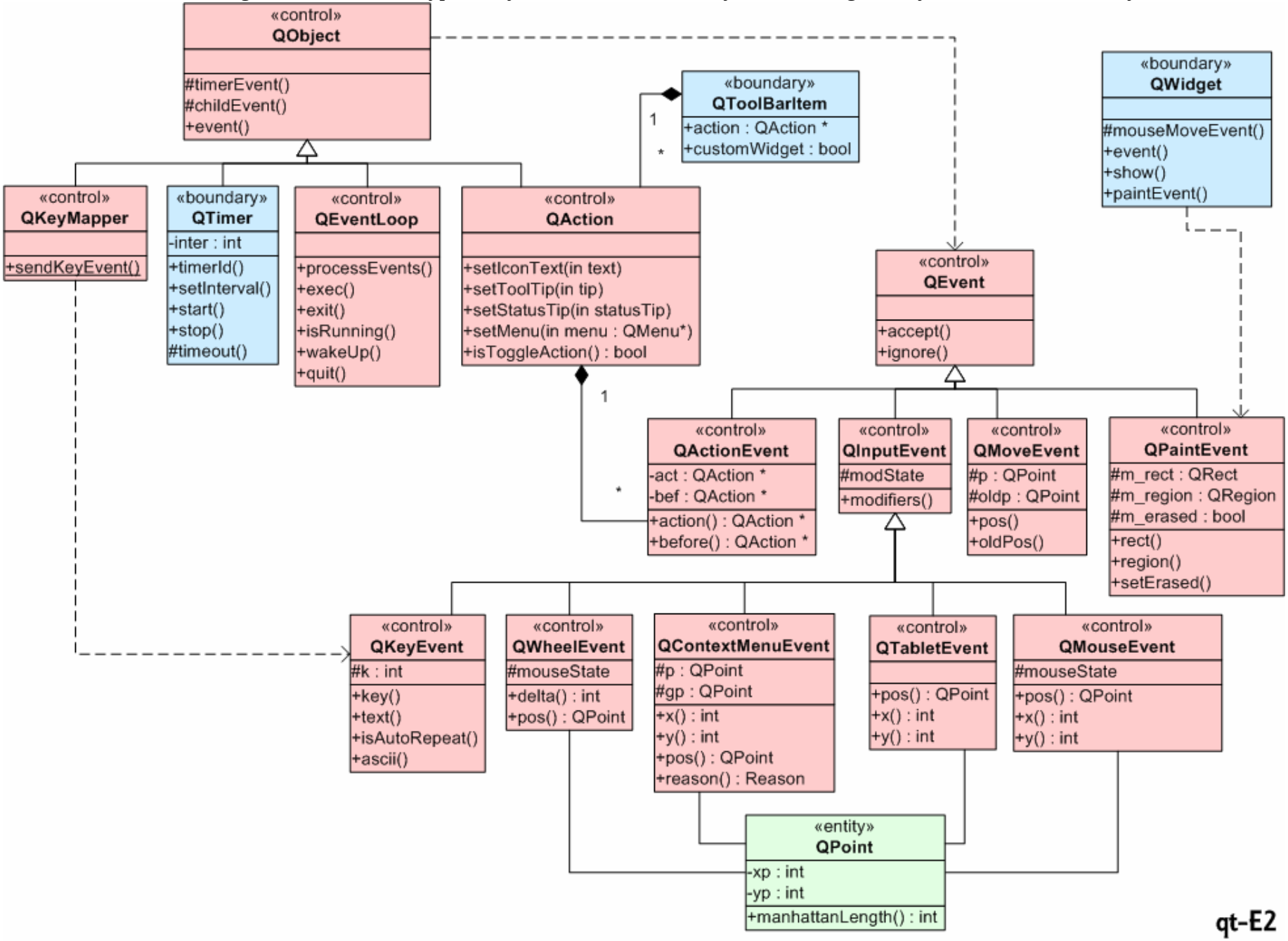
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



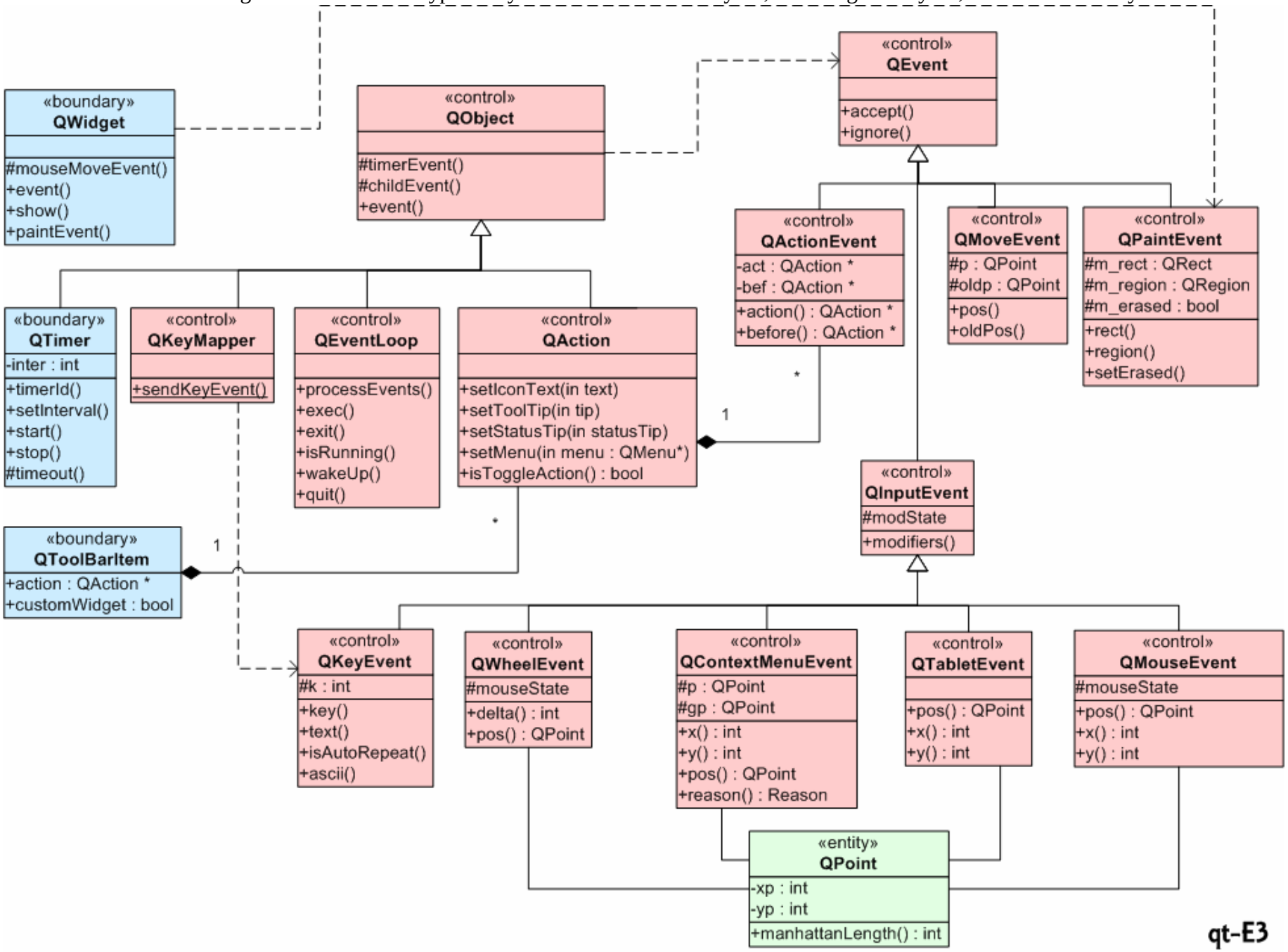
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



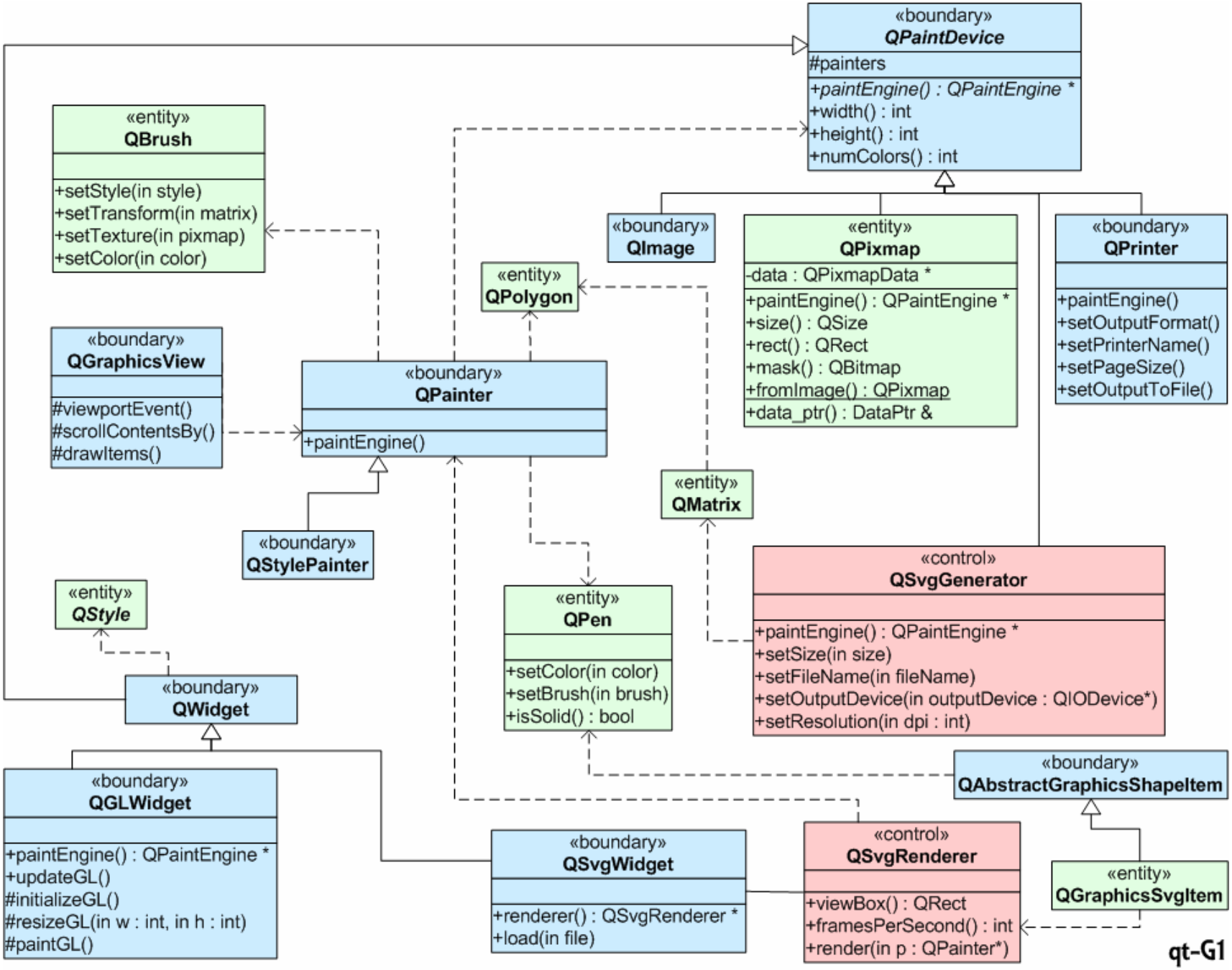
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



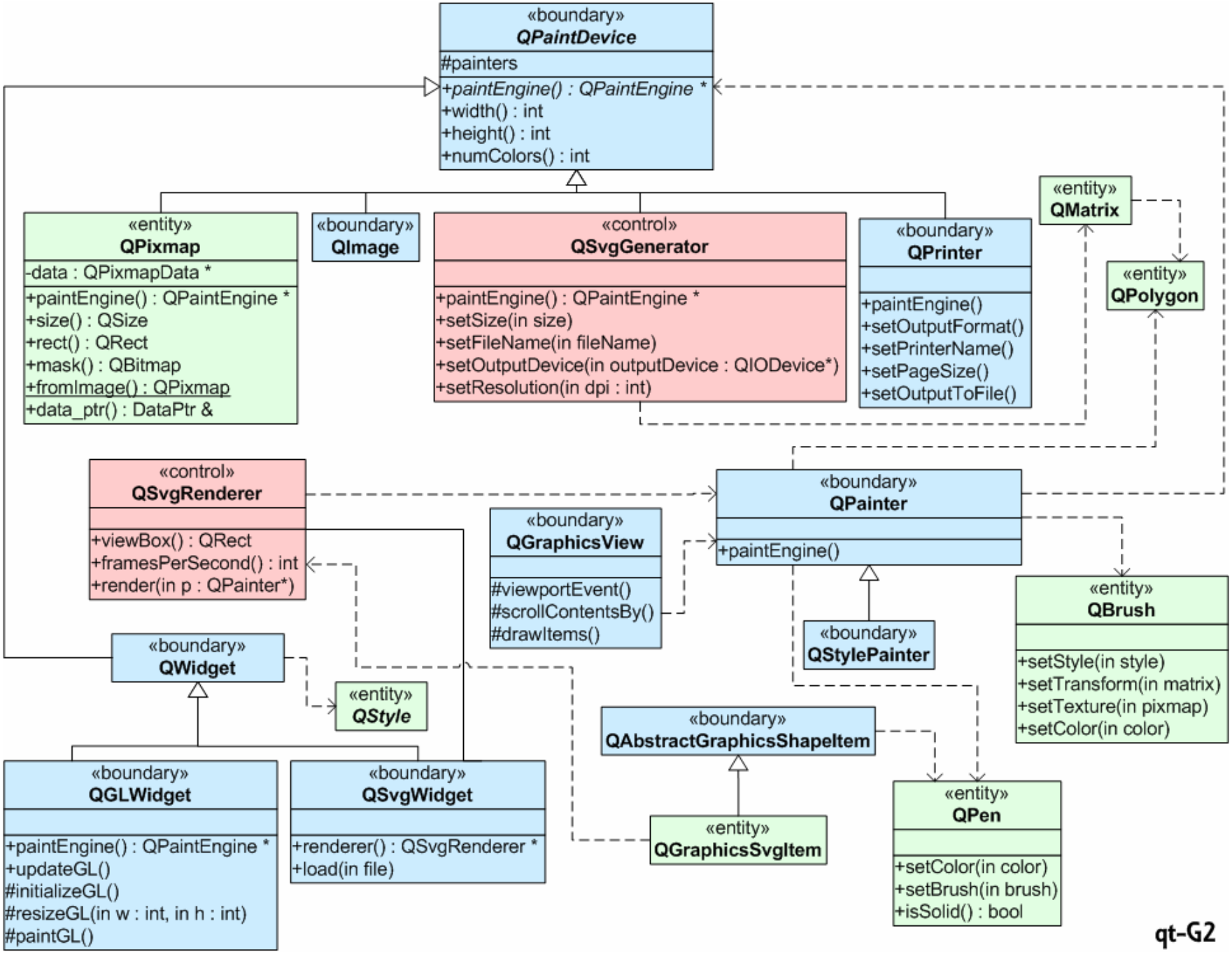
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



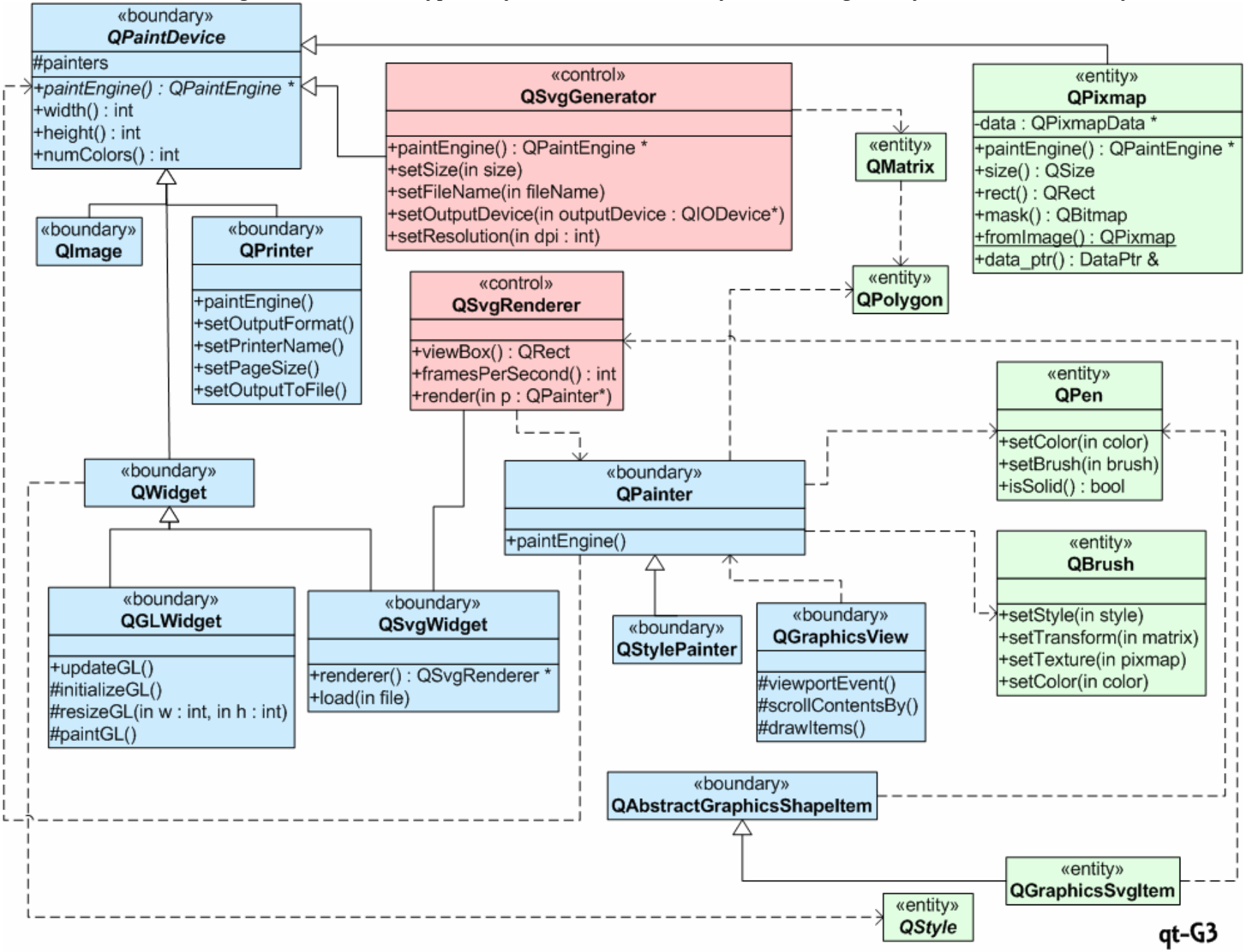
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



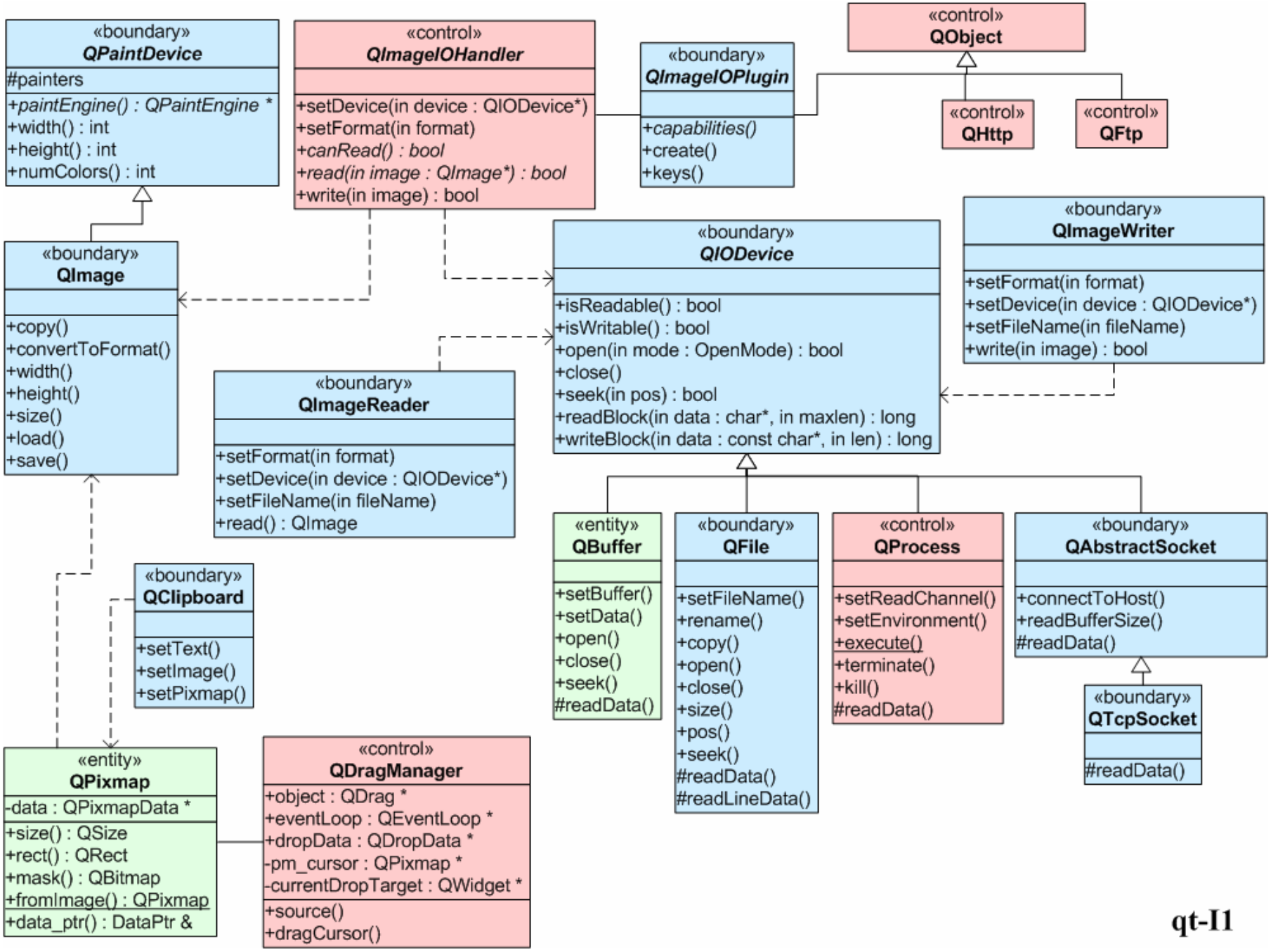
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



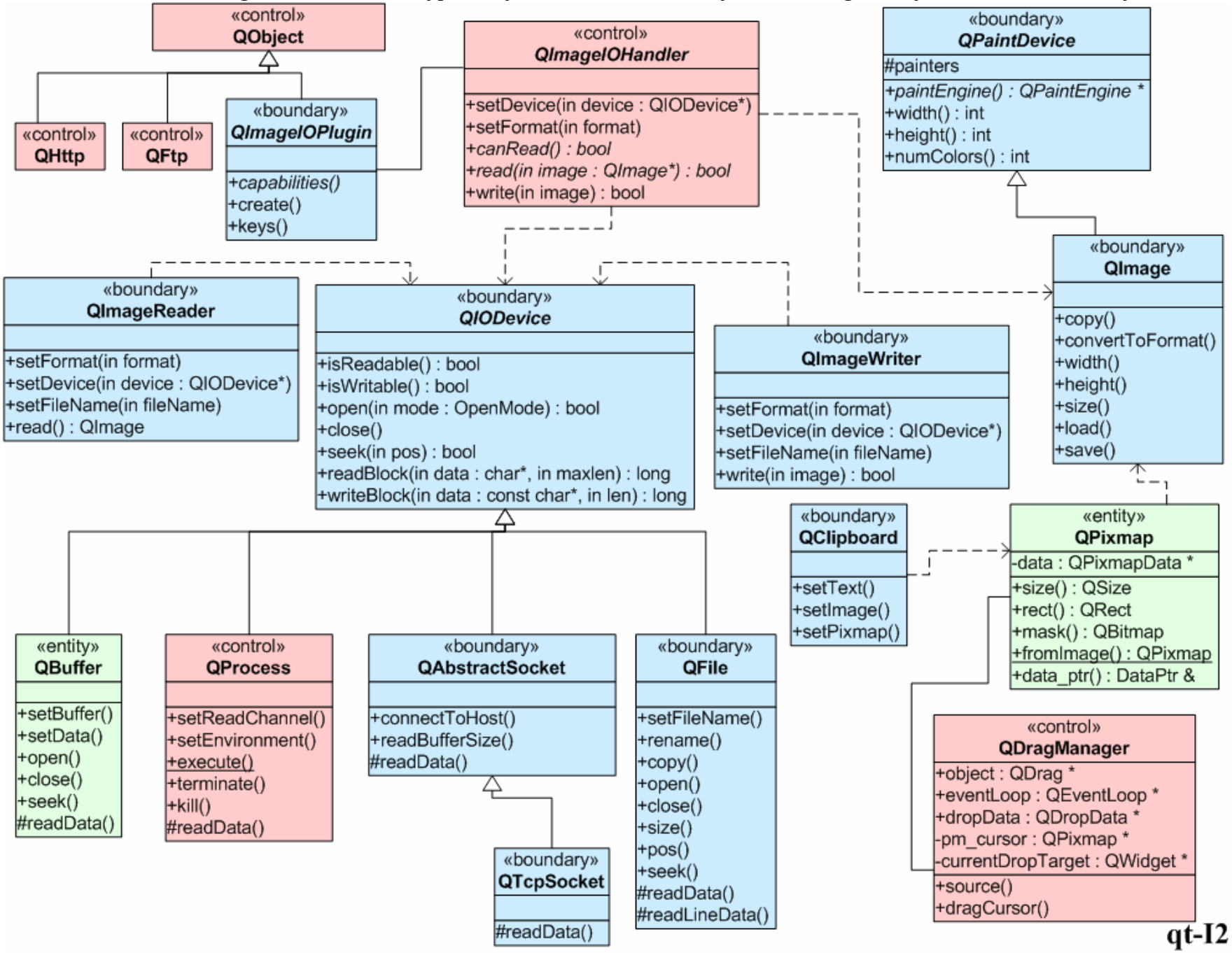
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



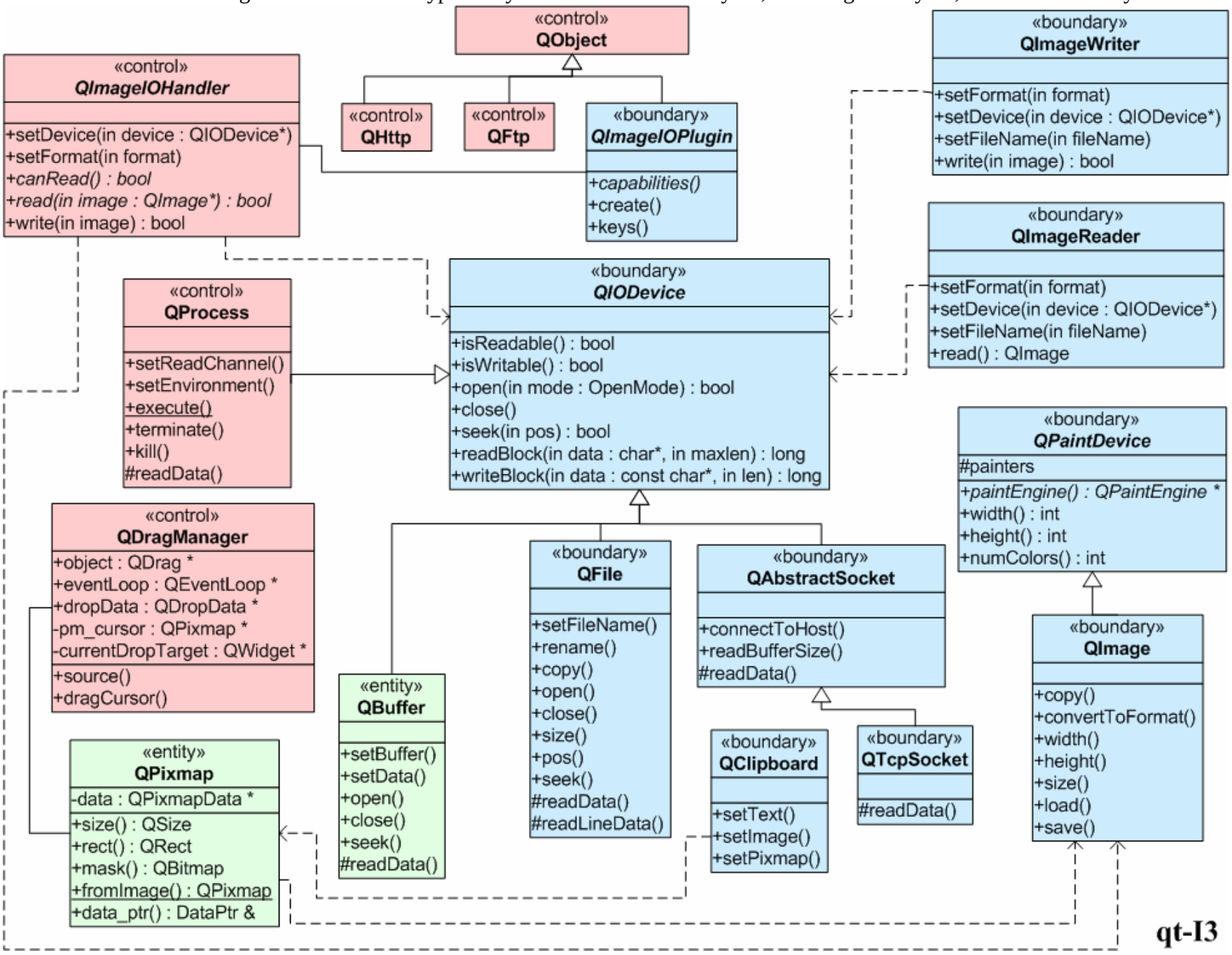
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



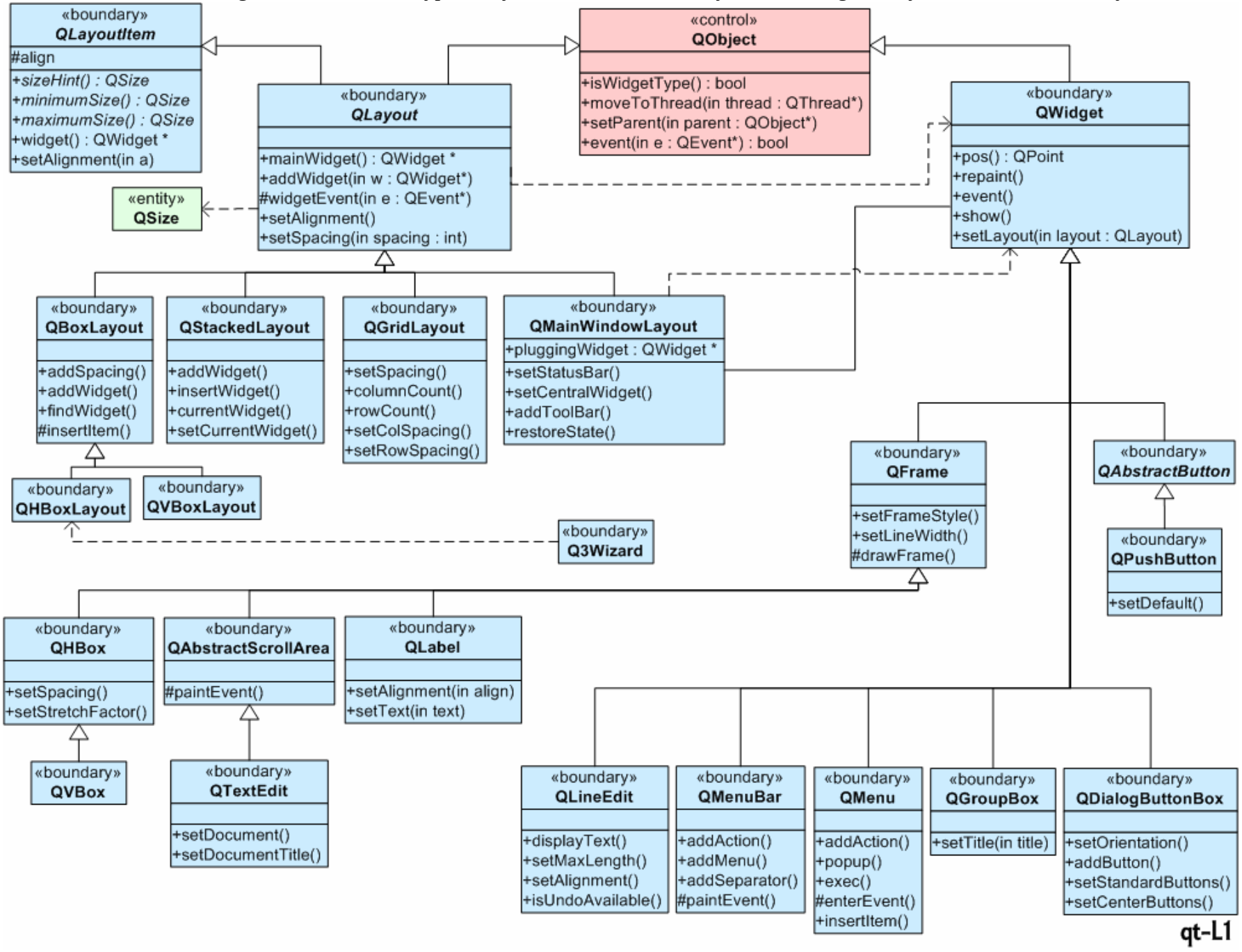
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



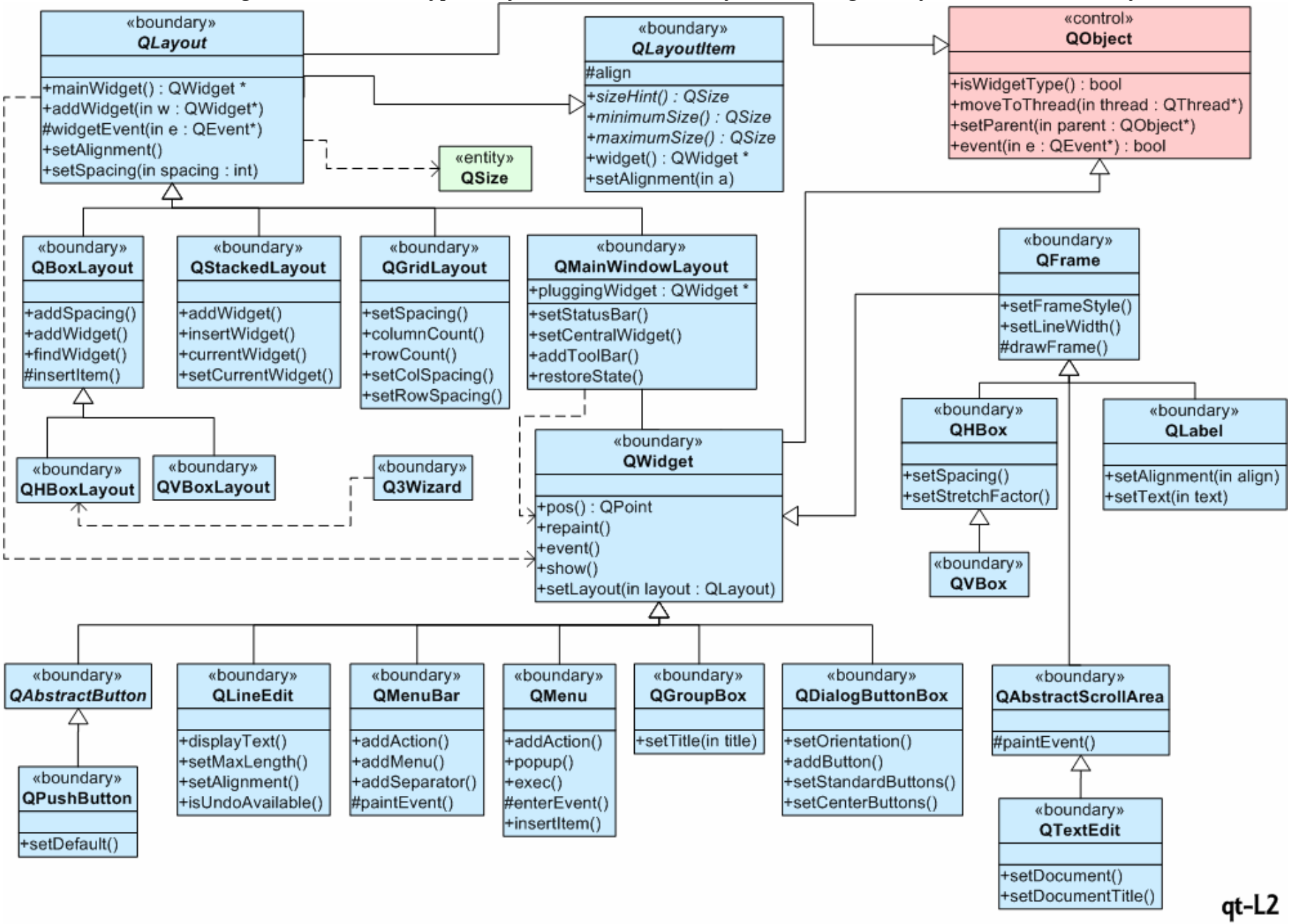
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



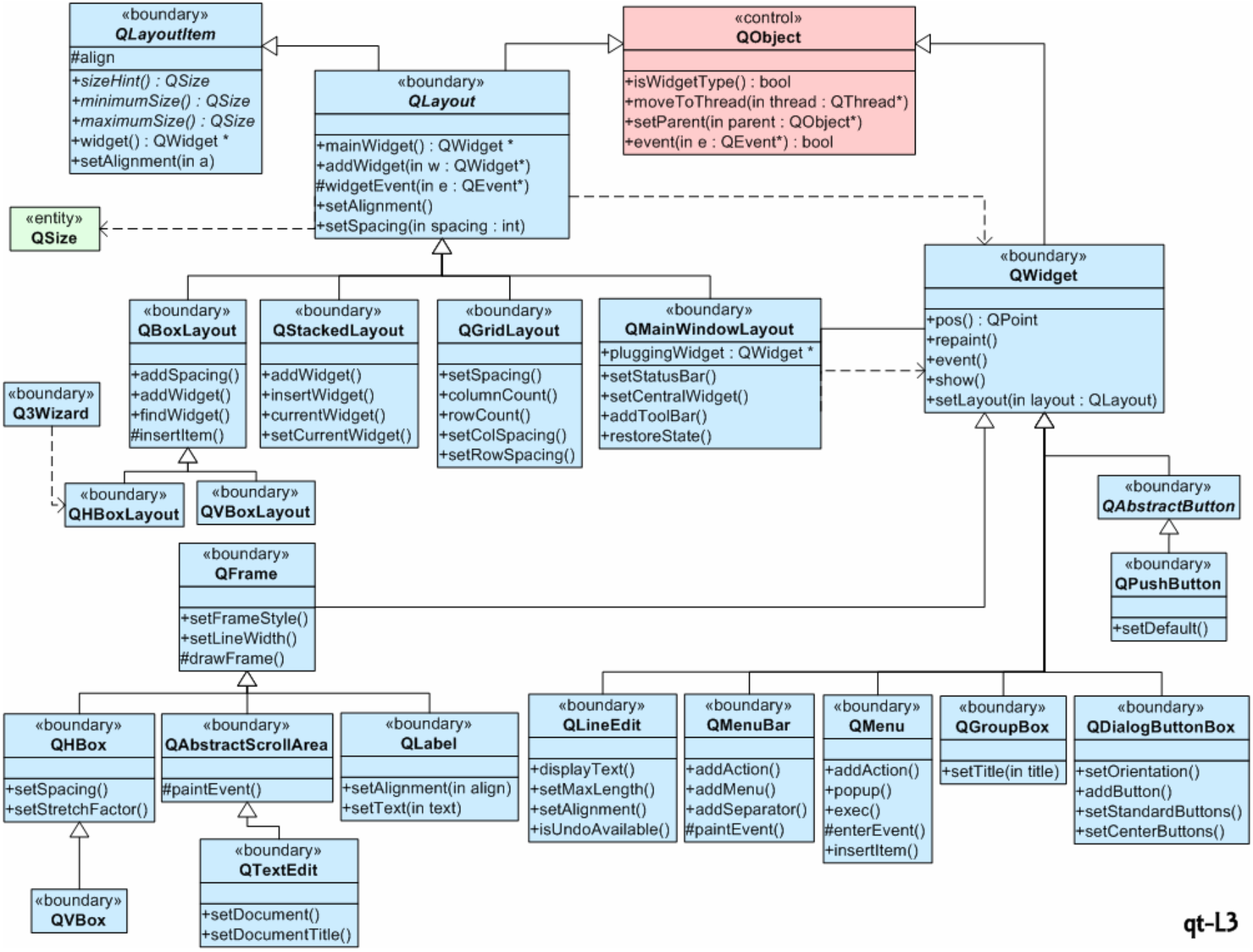
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



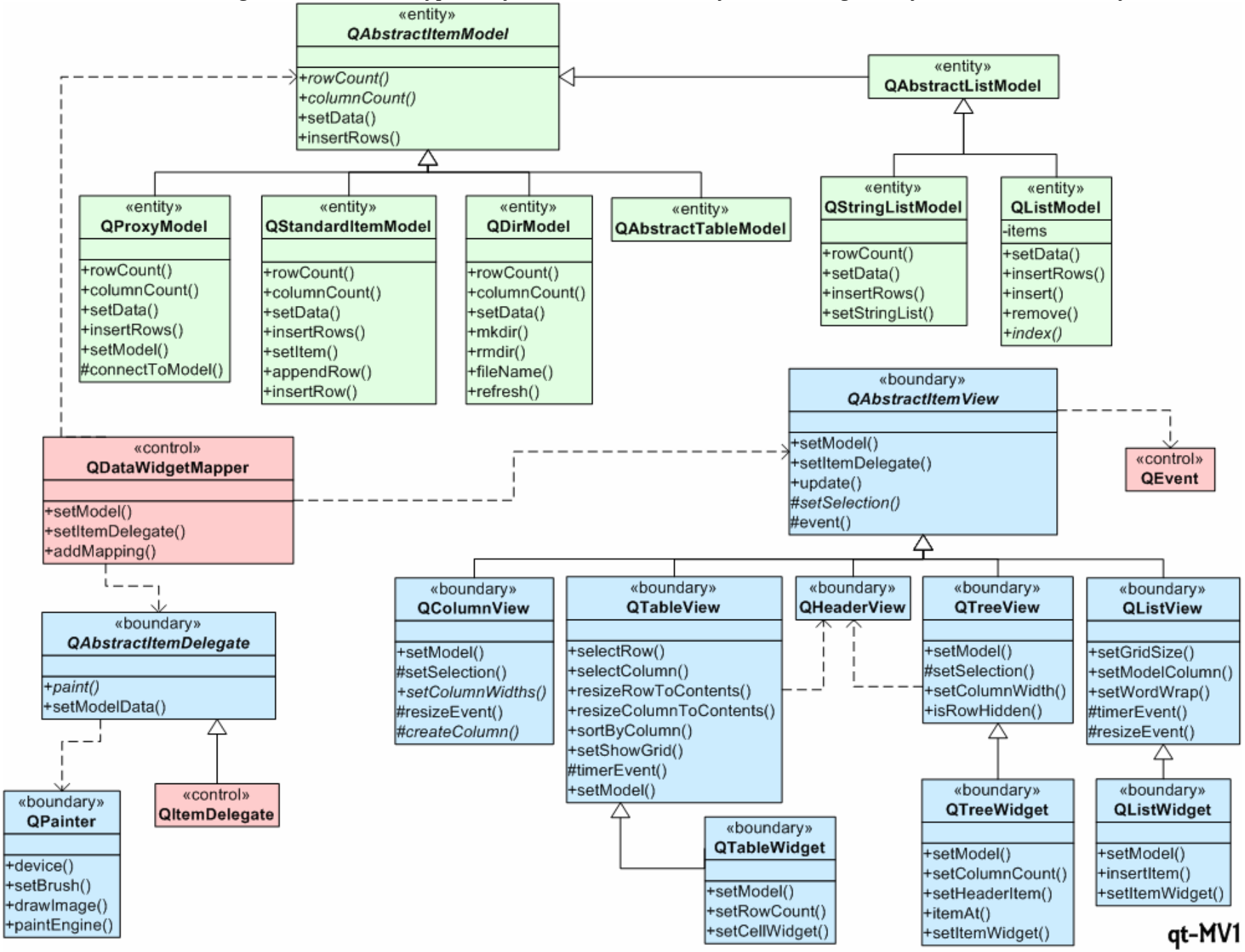
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



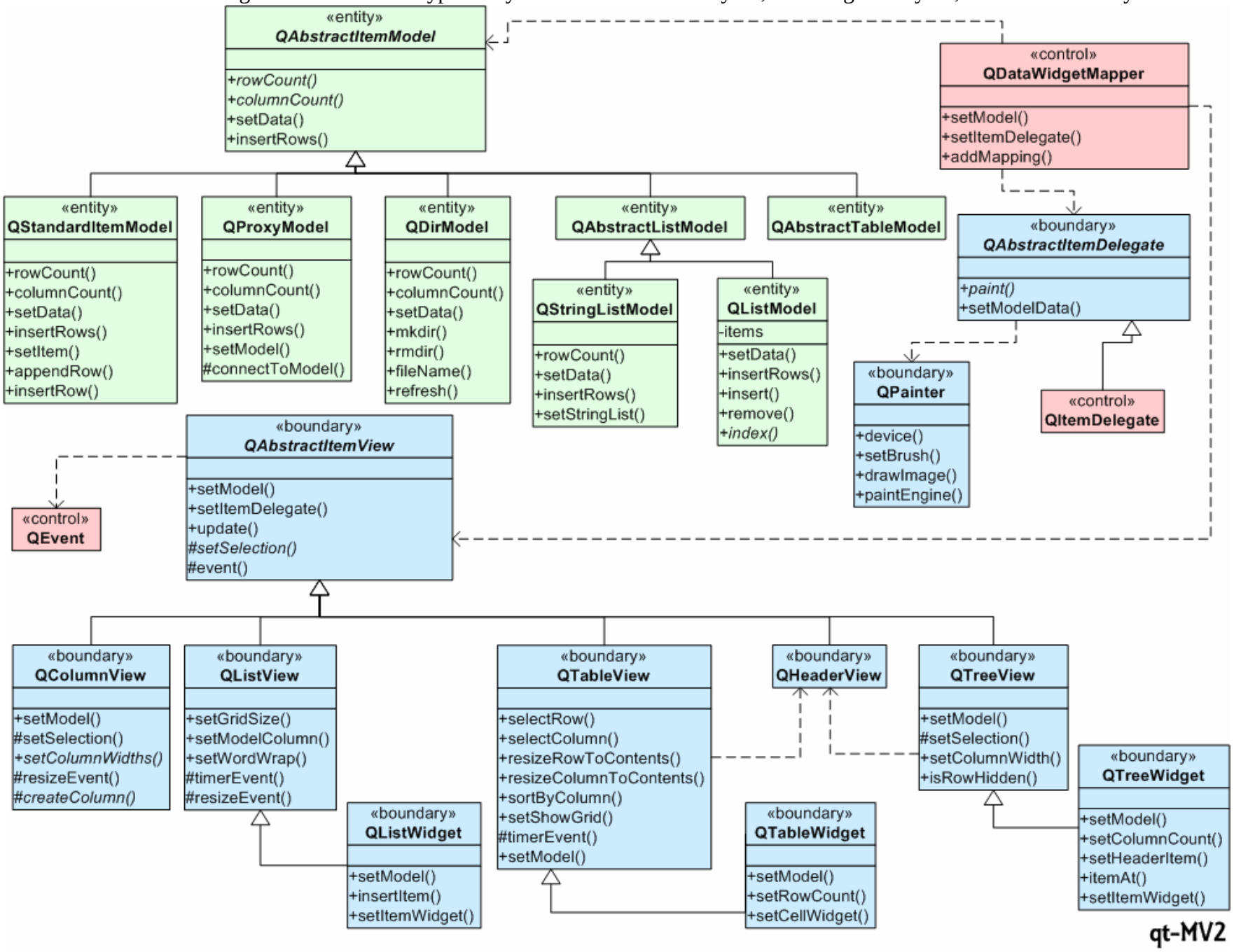
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



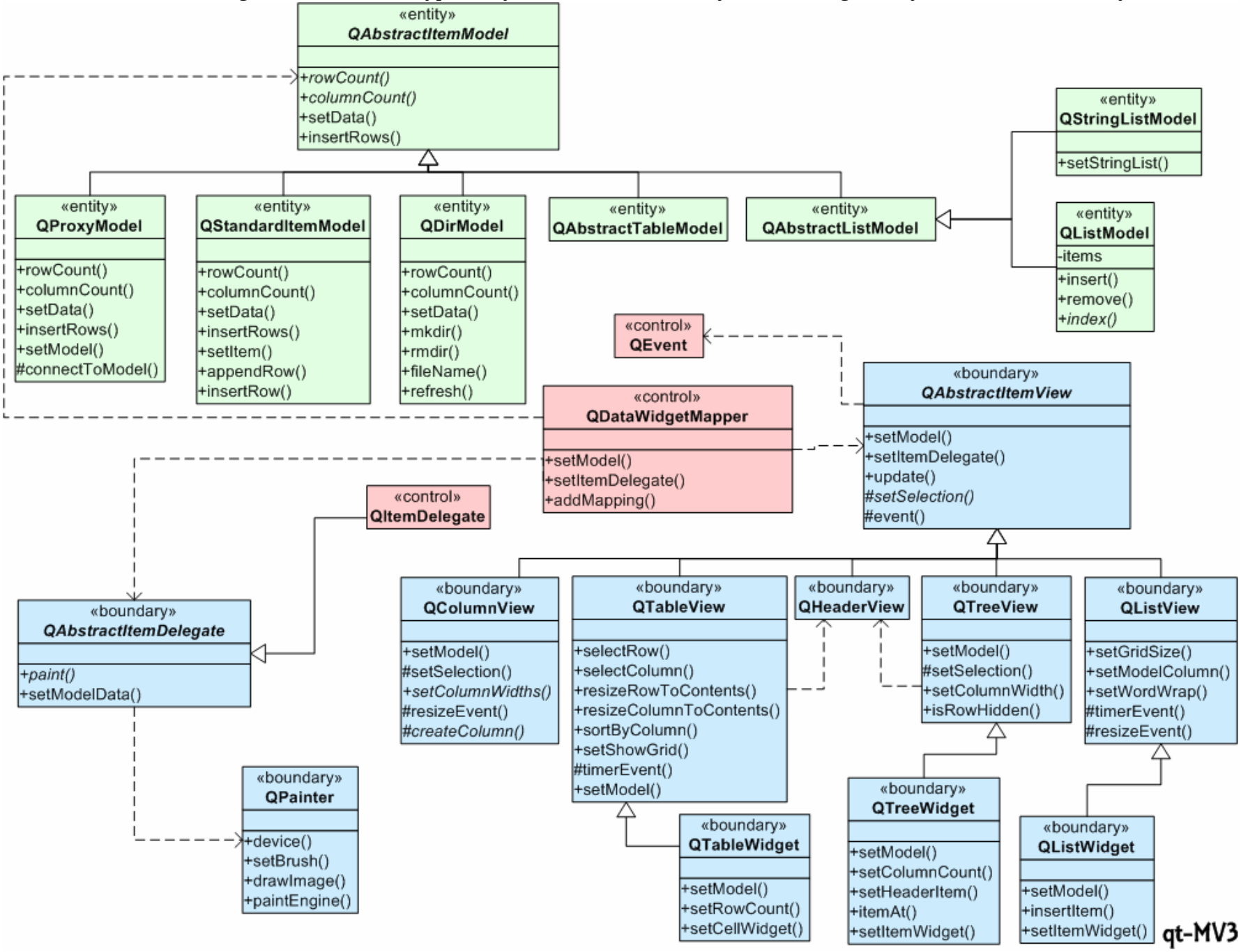
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



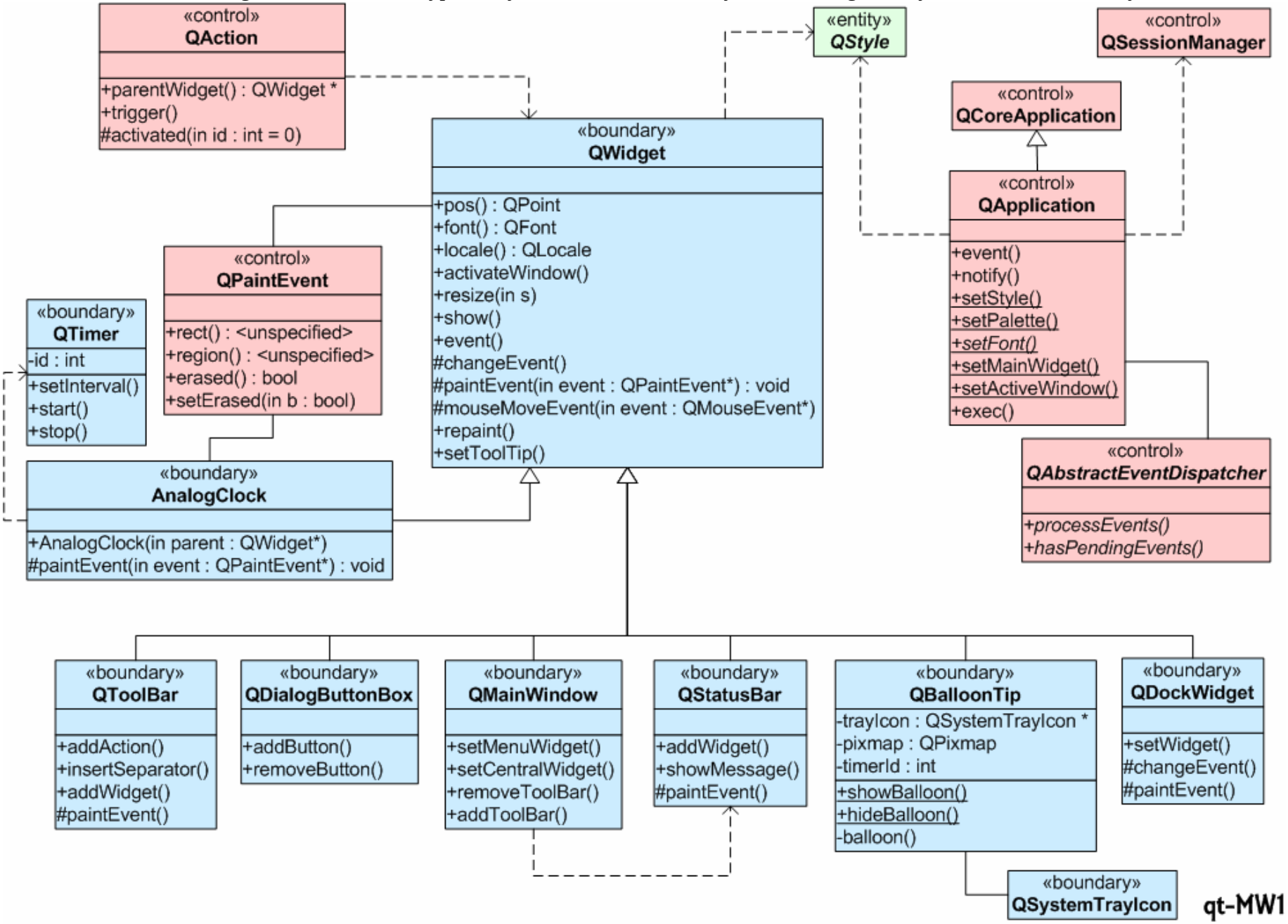
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



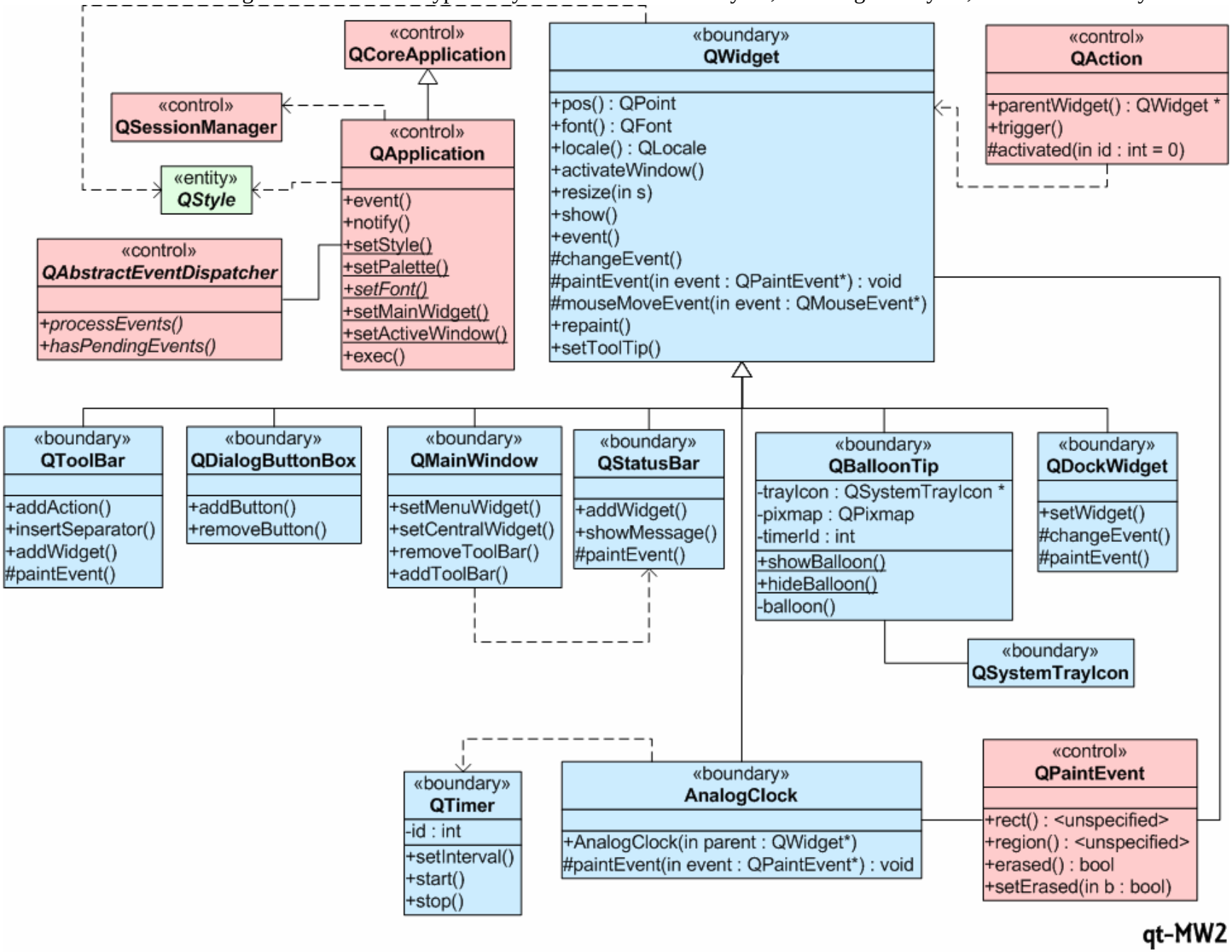
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



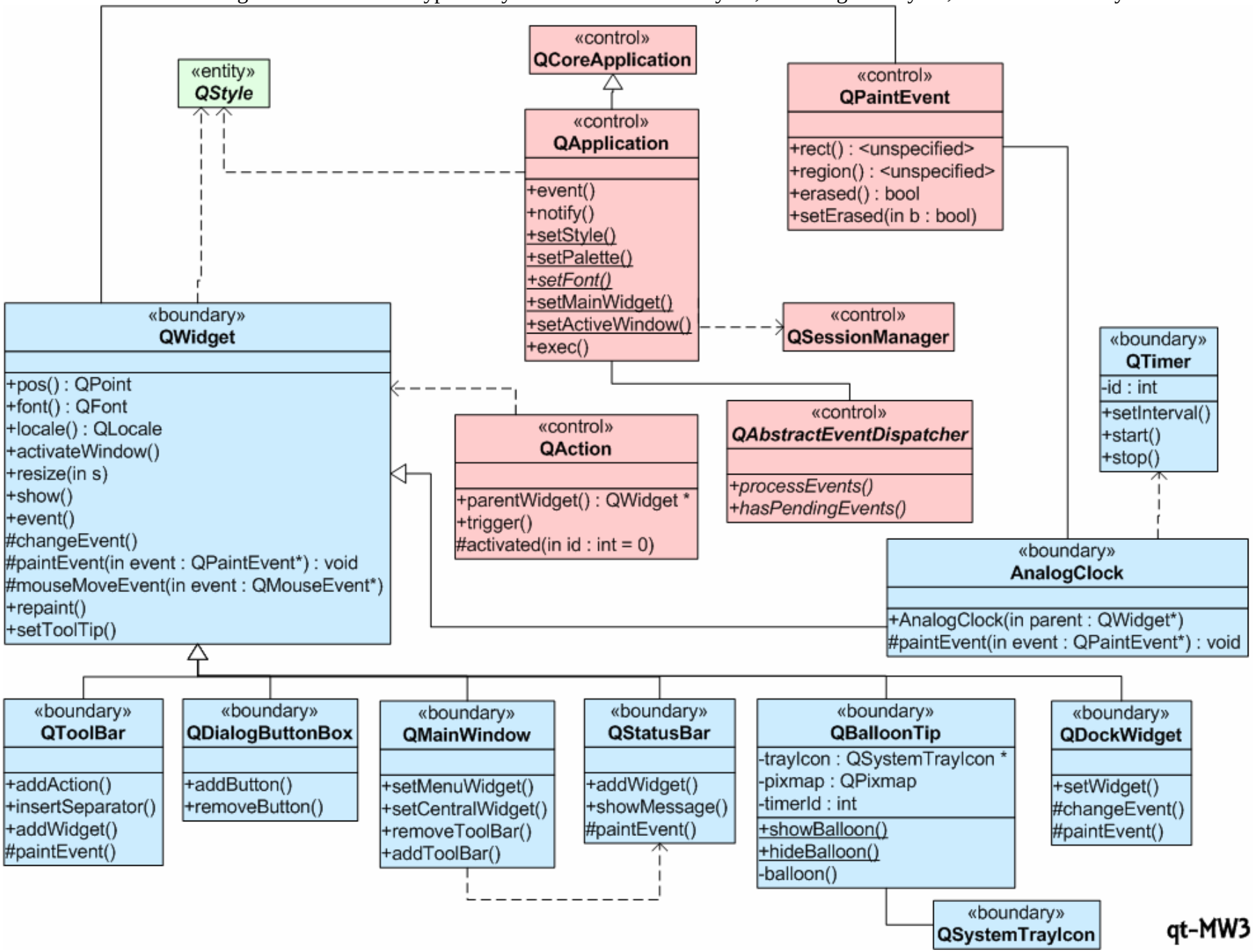
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



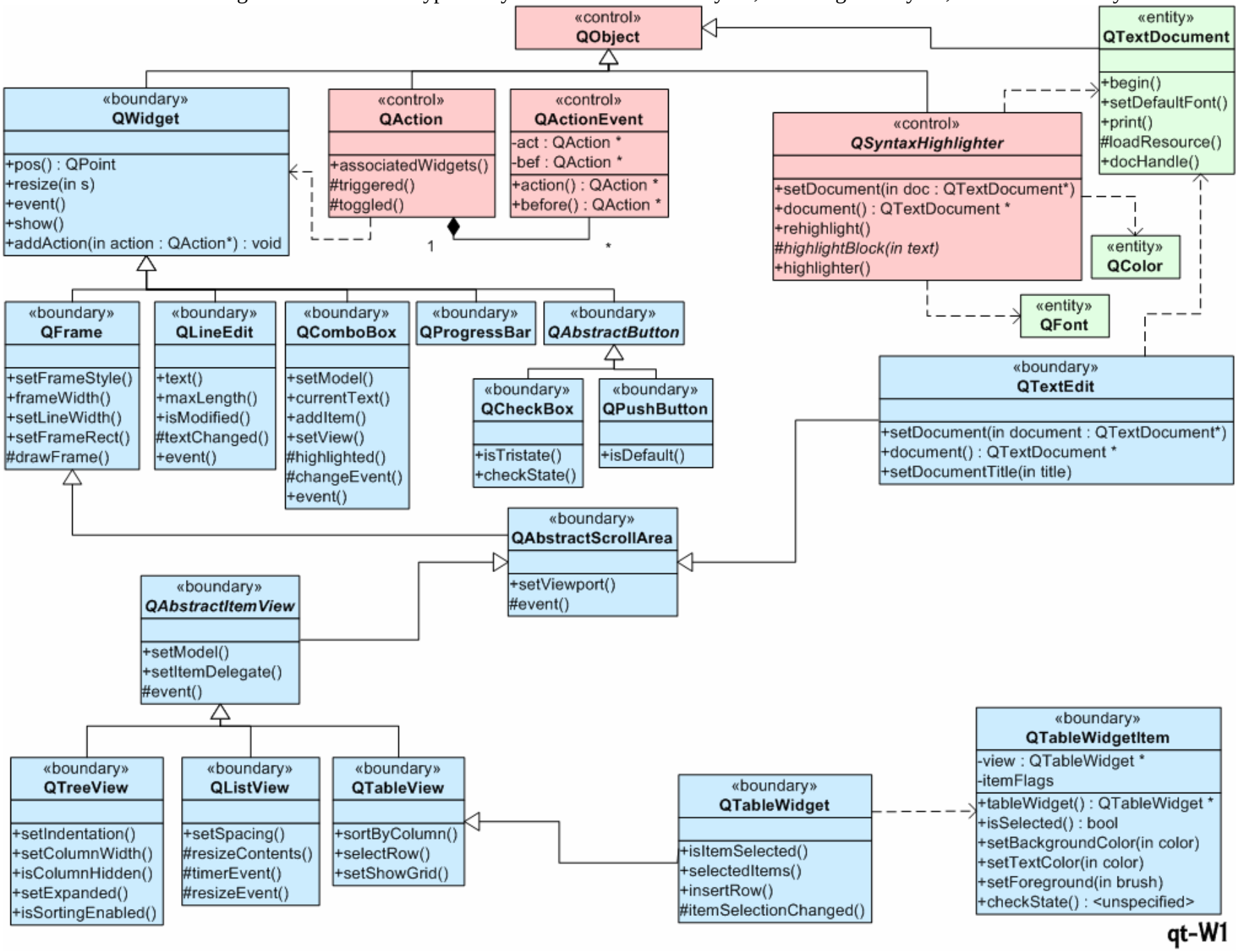
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



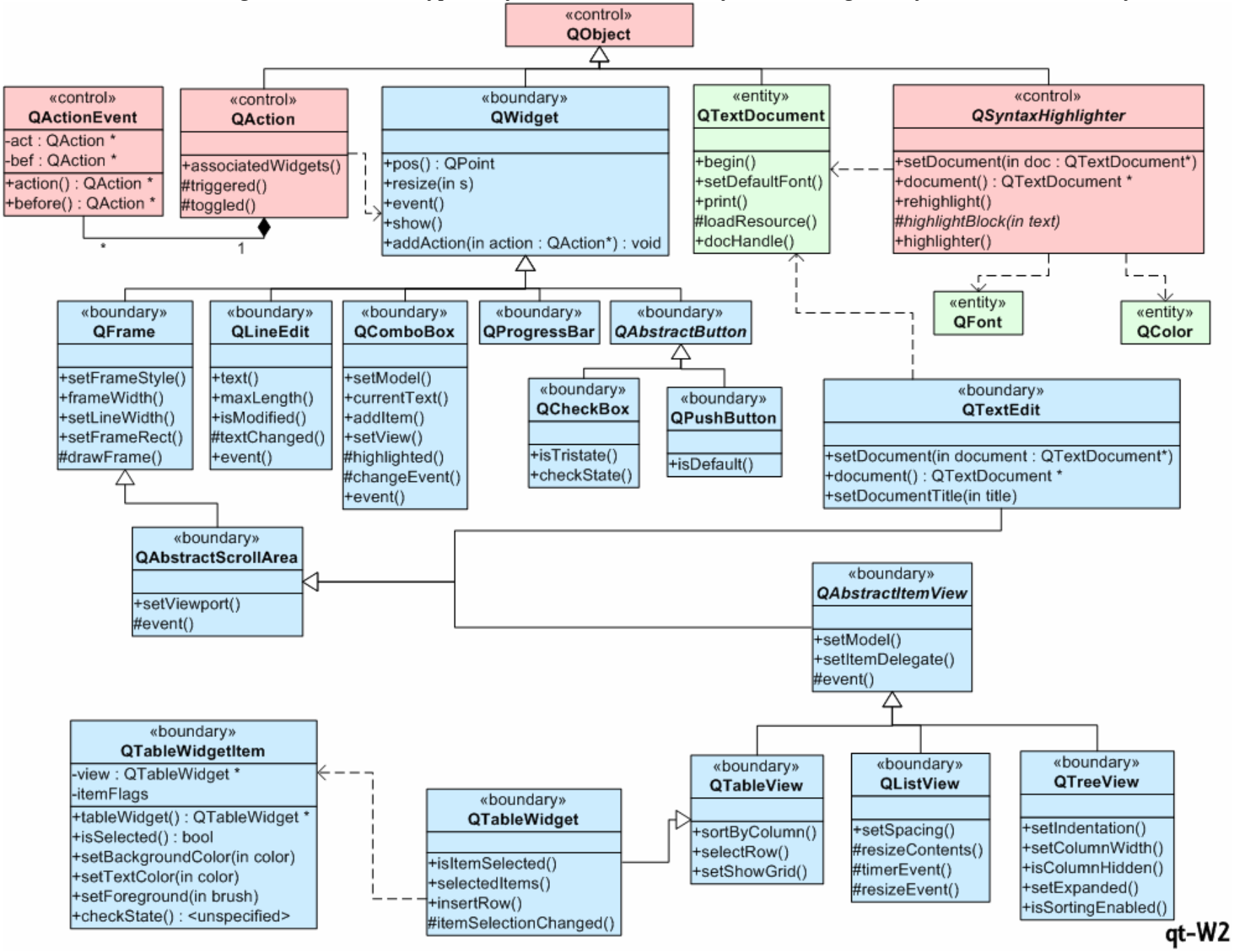
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



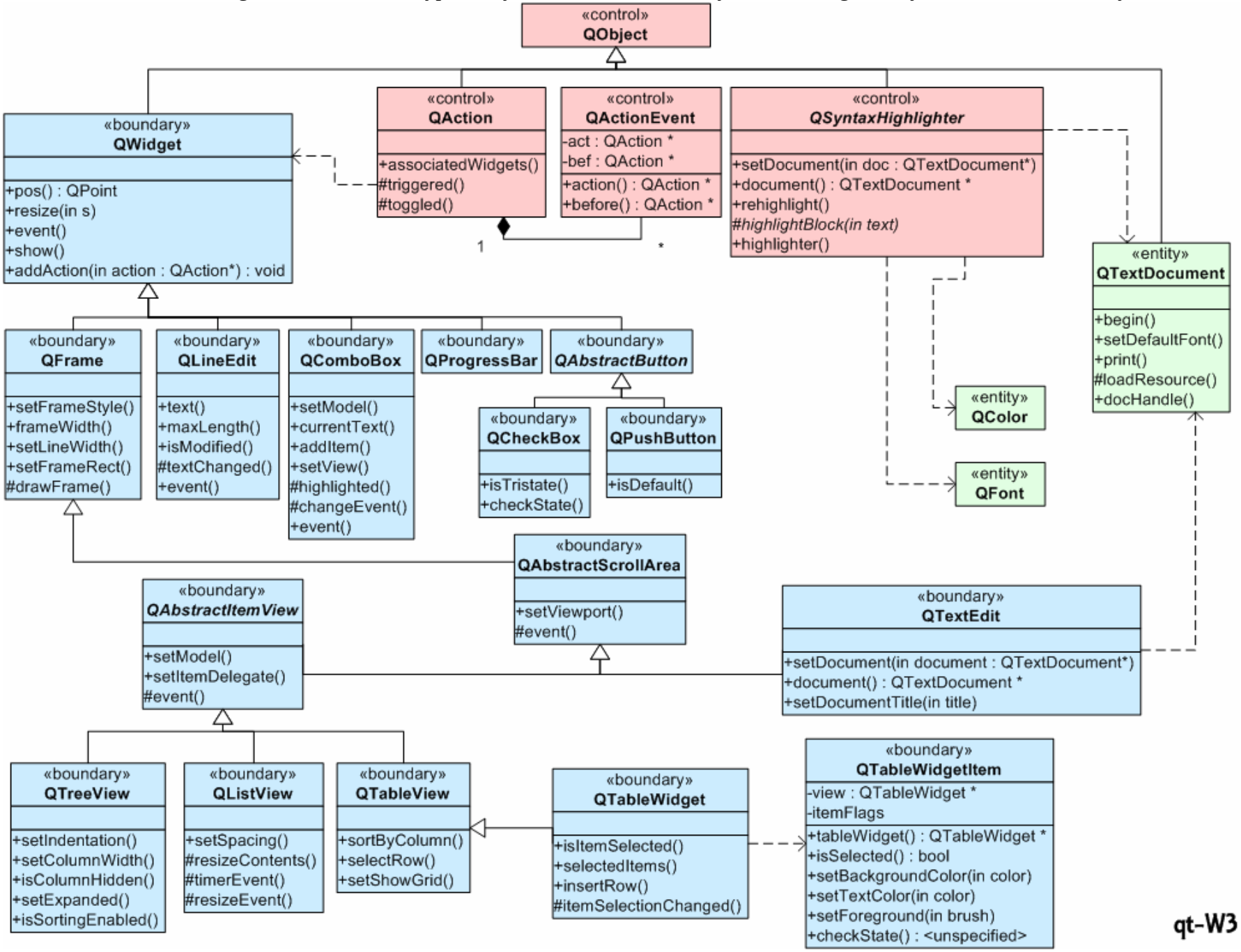
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



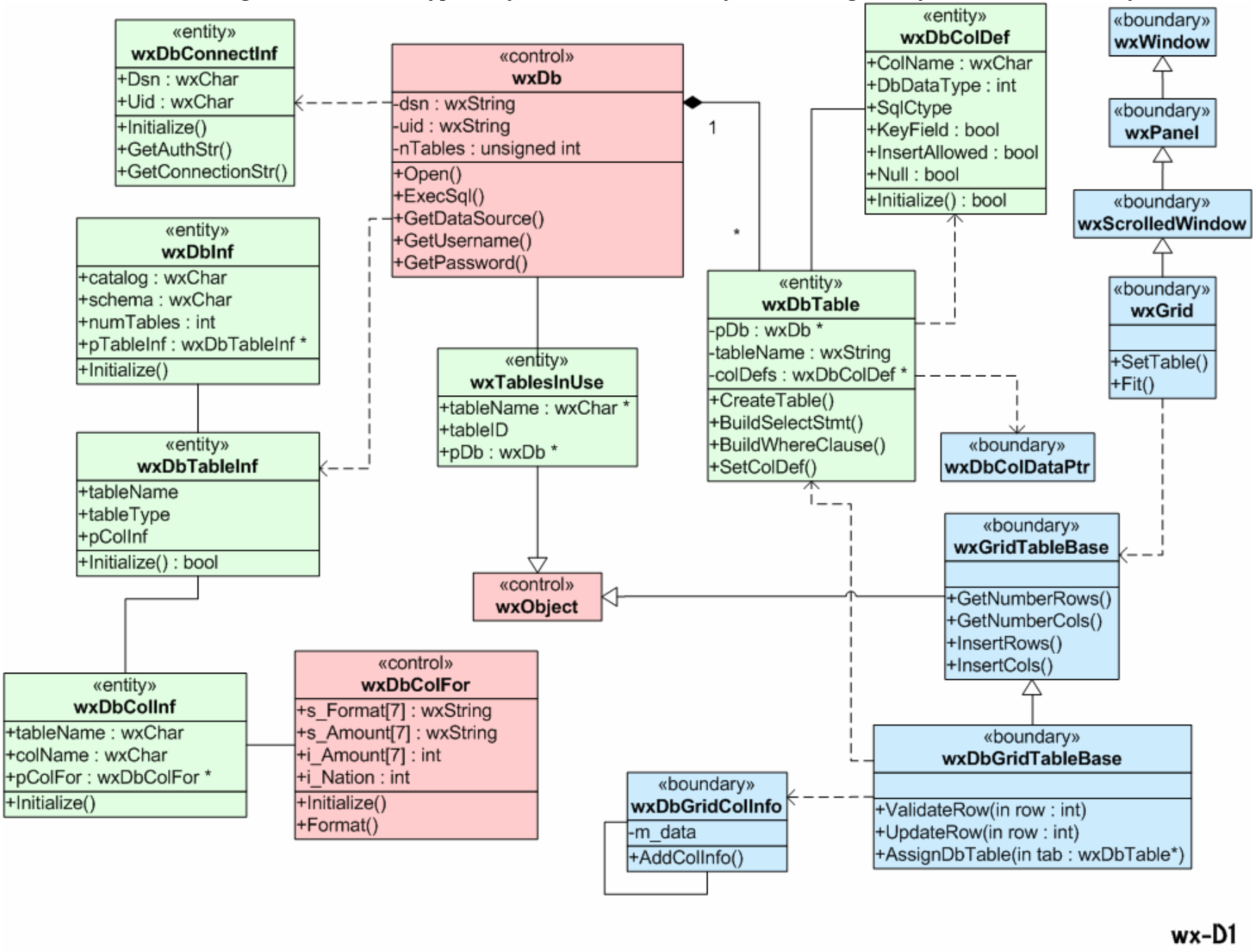
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

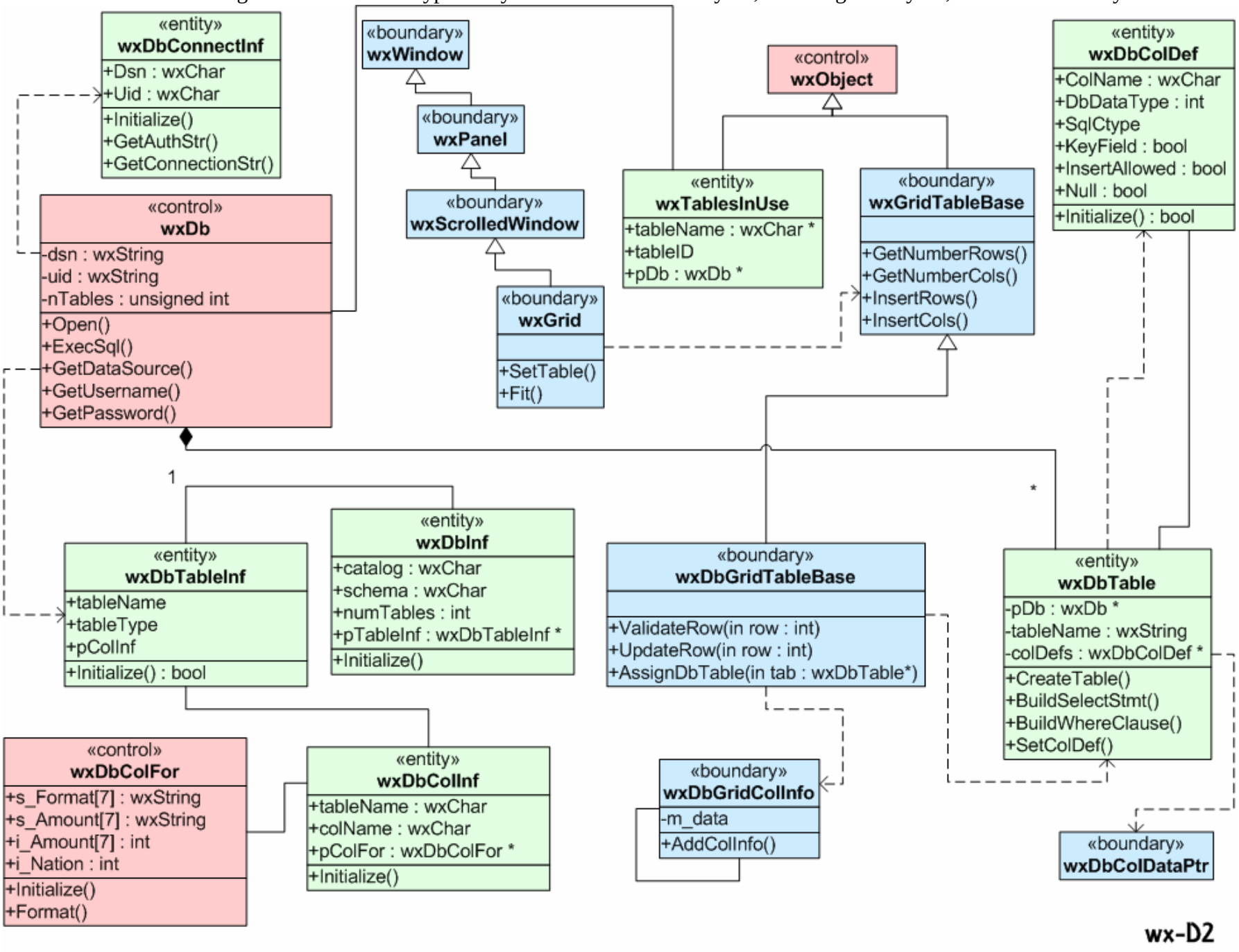


The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

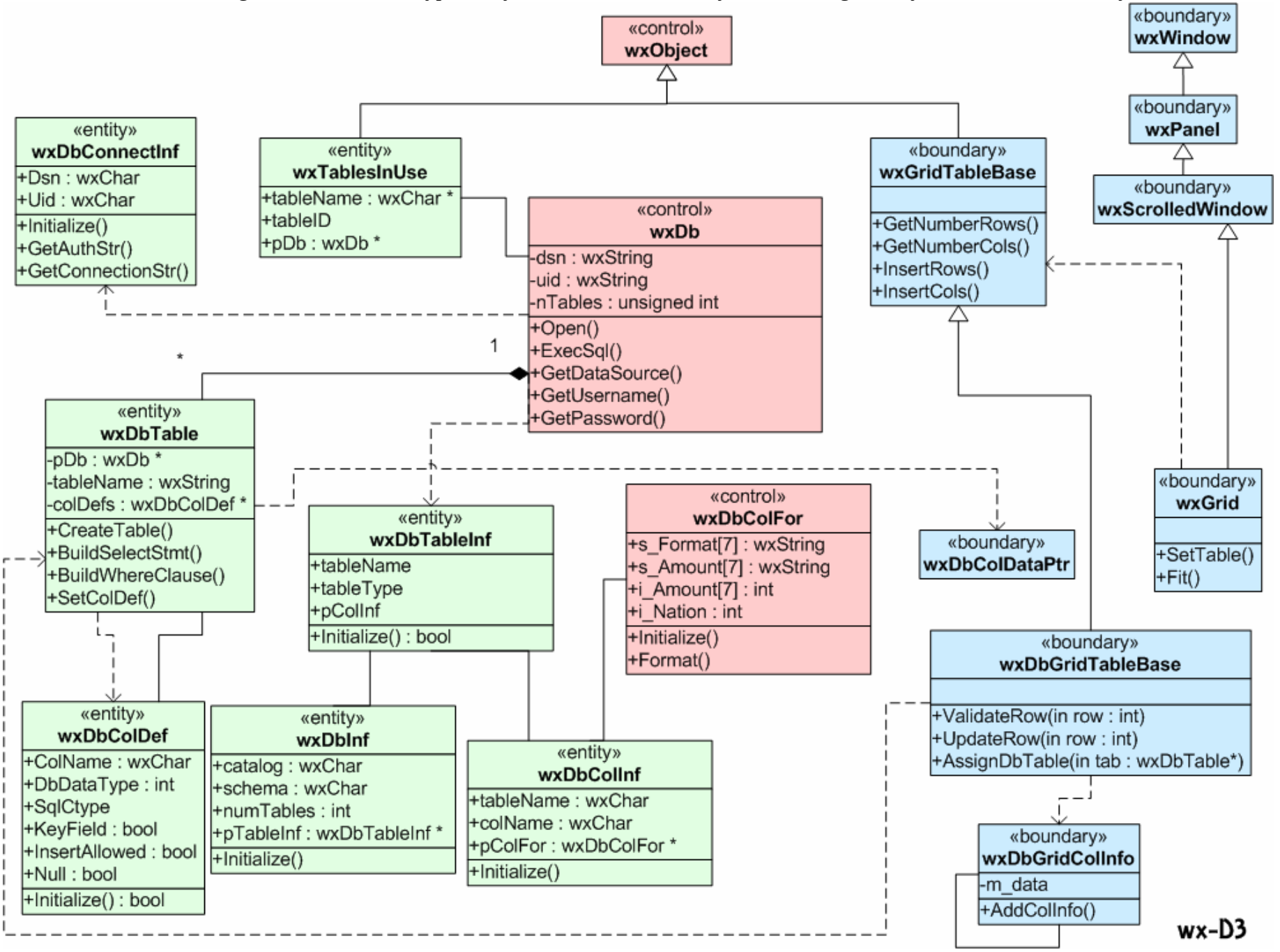


wx-D1

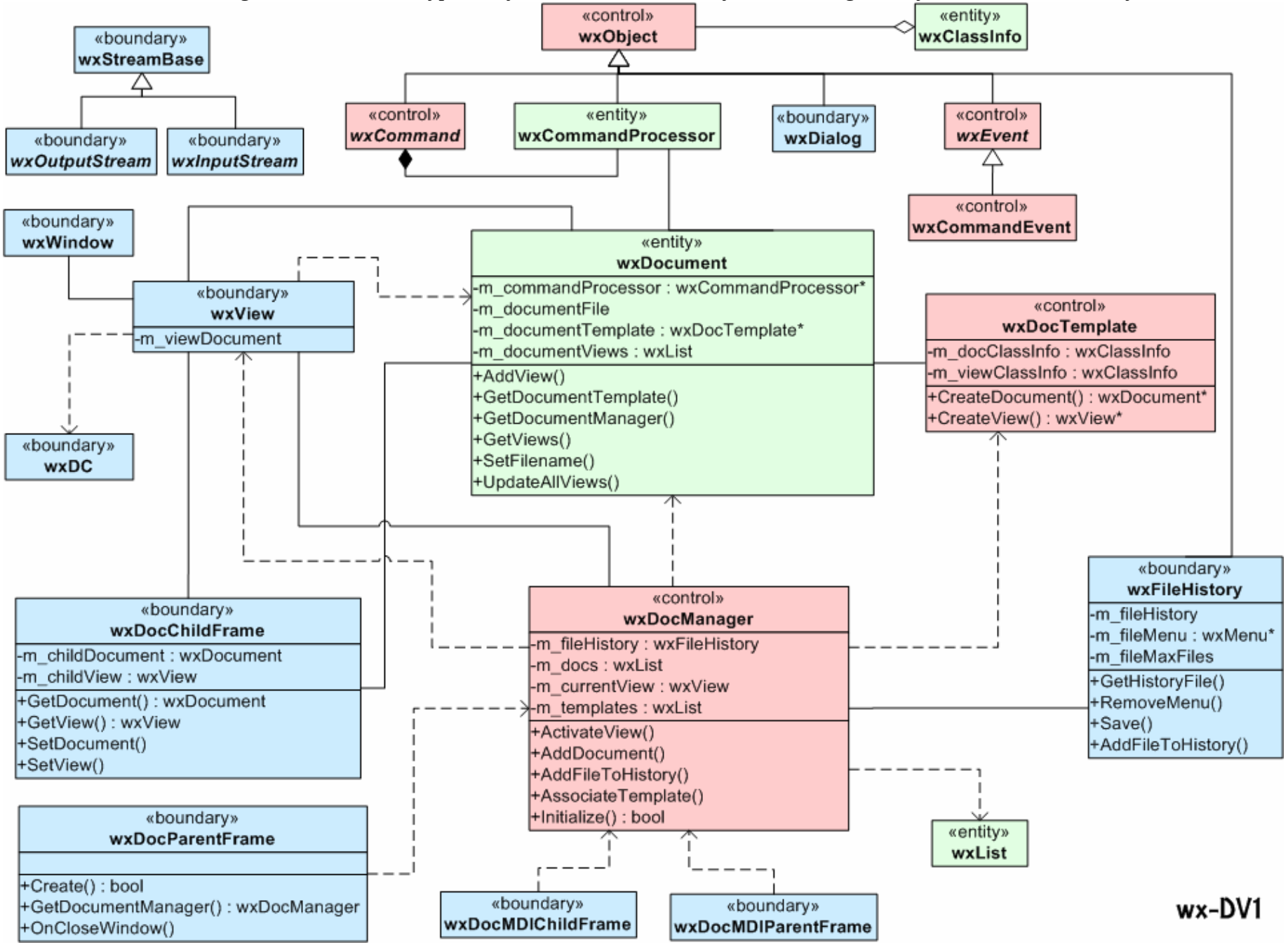
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



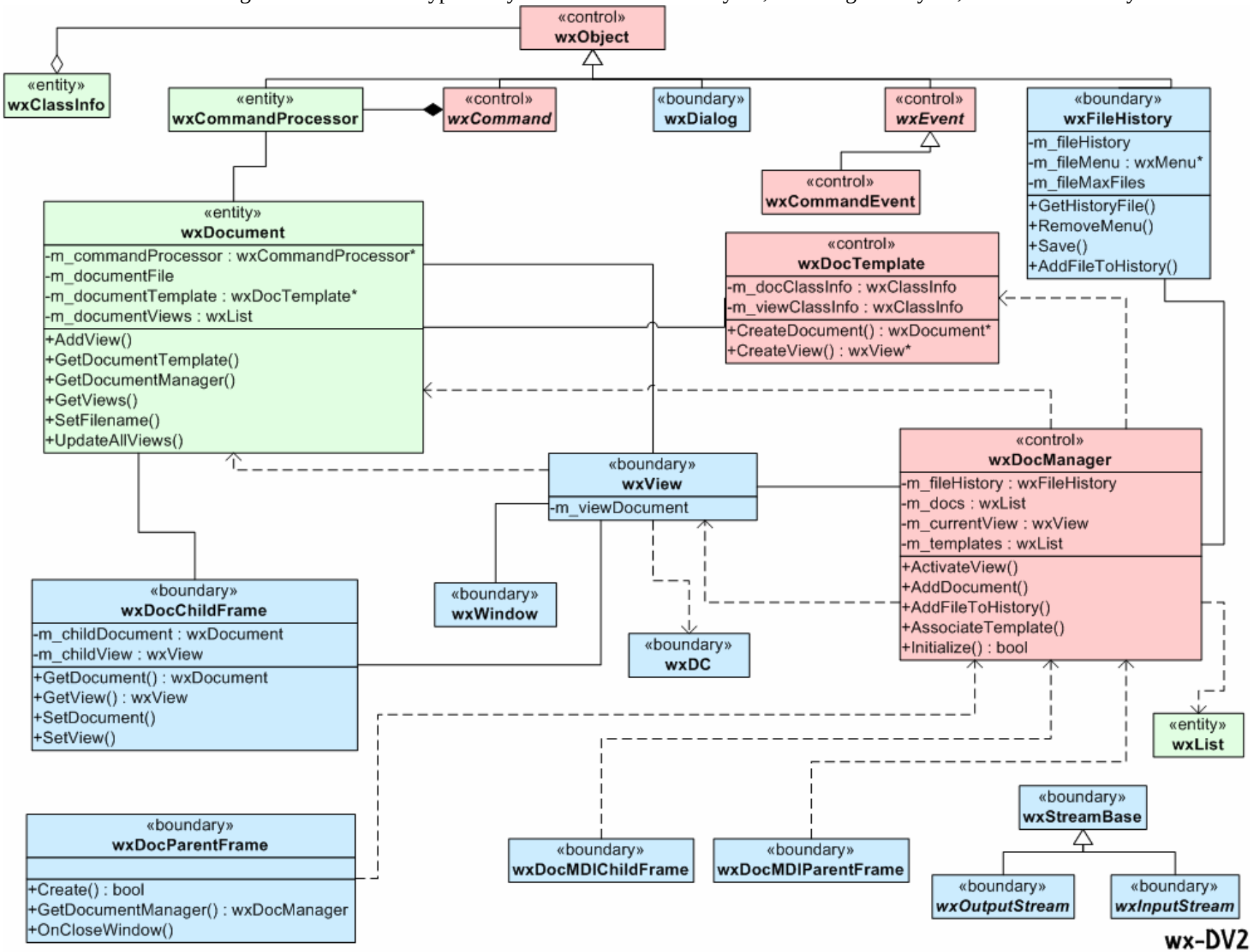
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



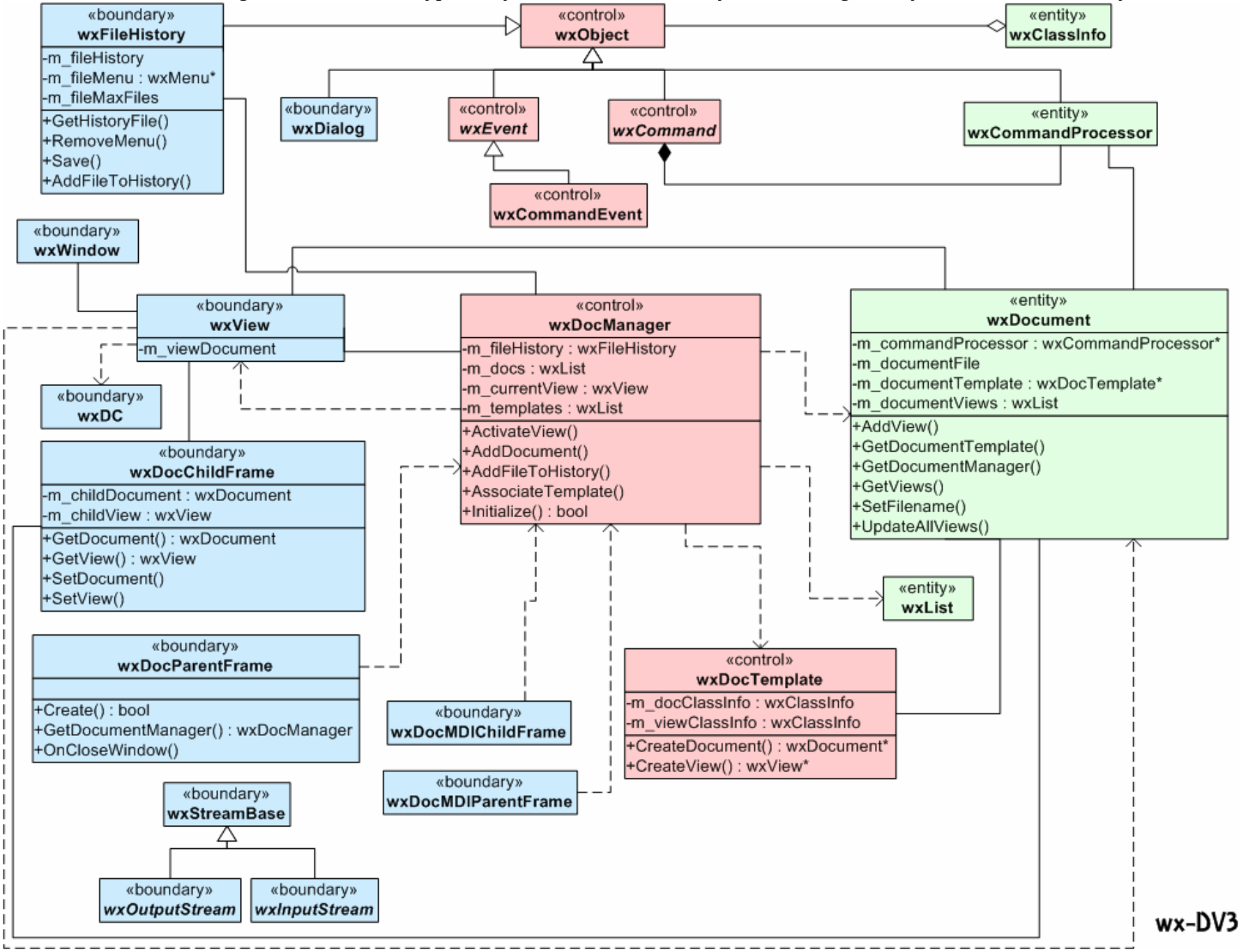
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



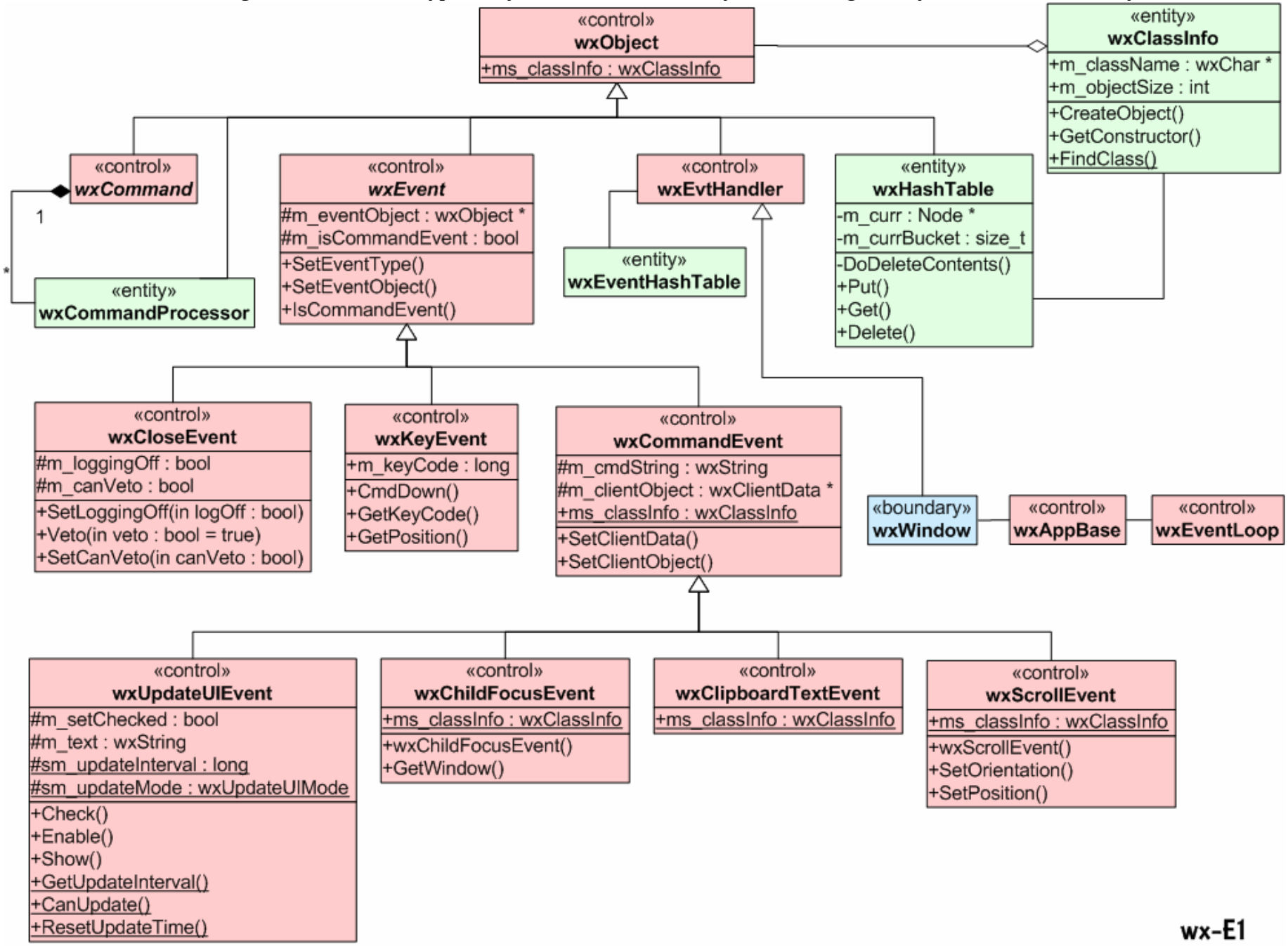
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

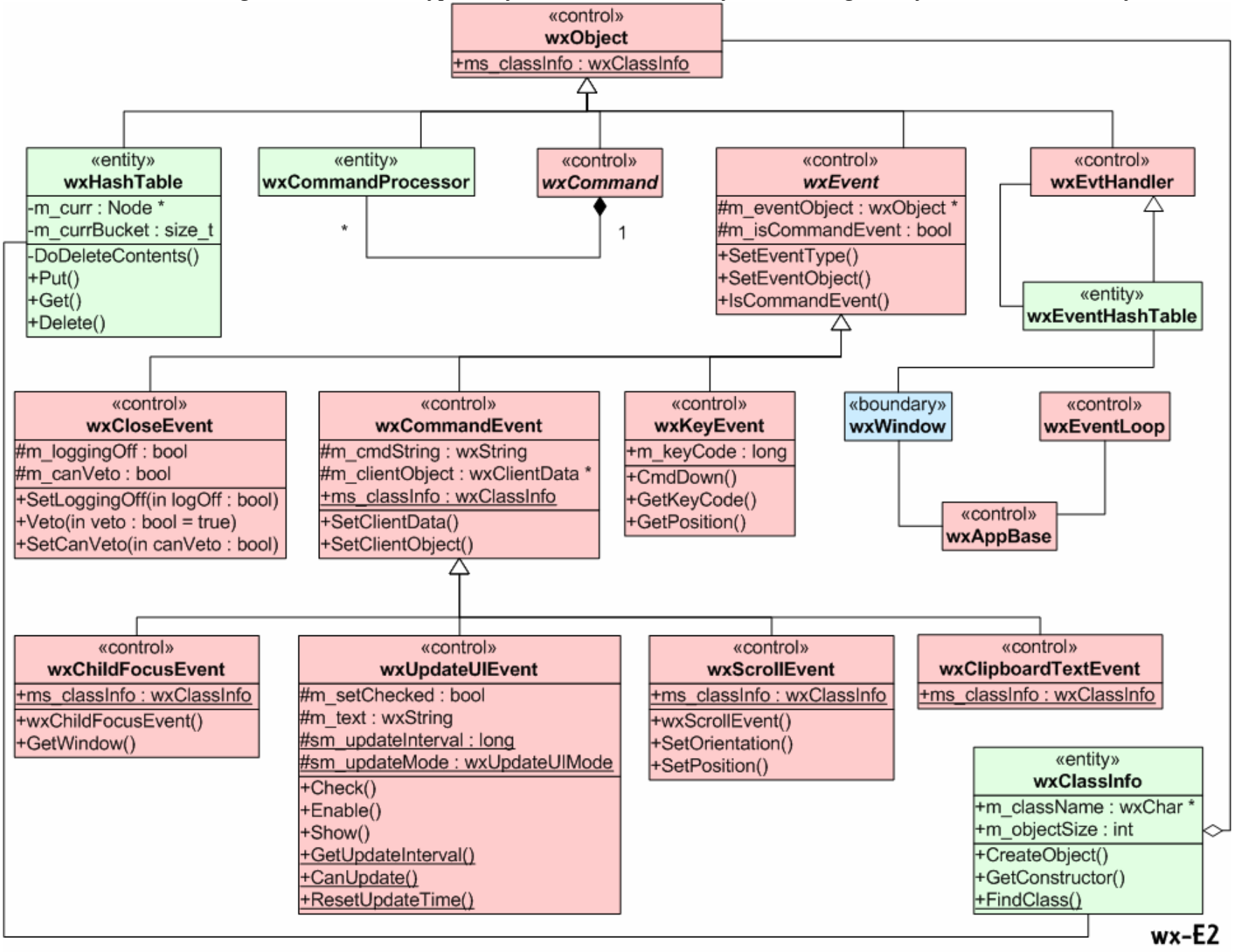


The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

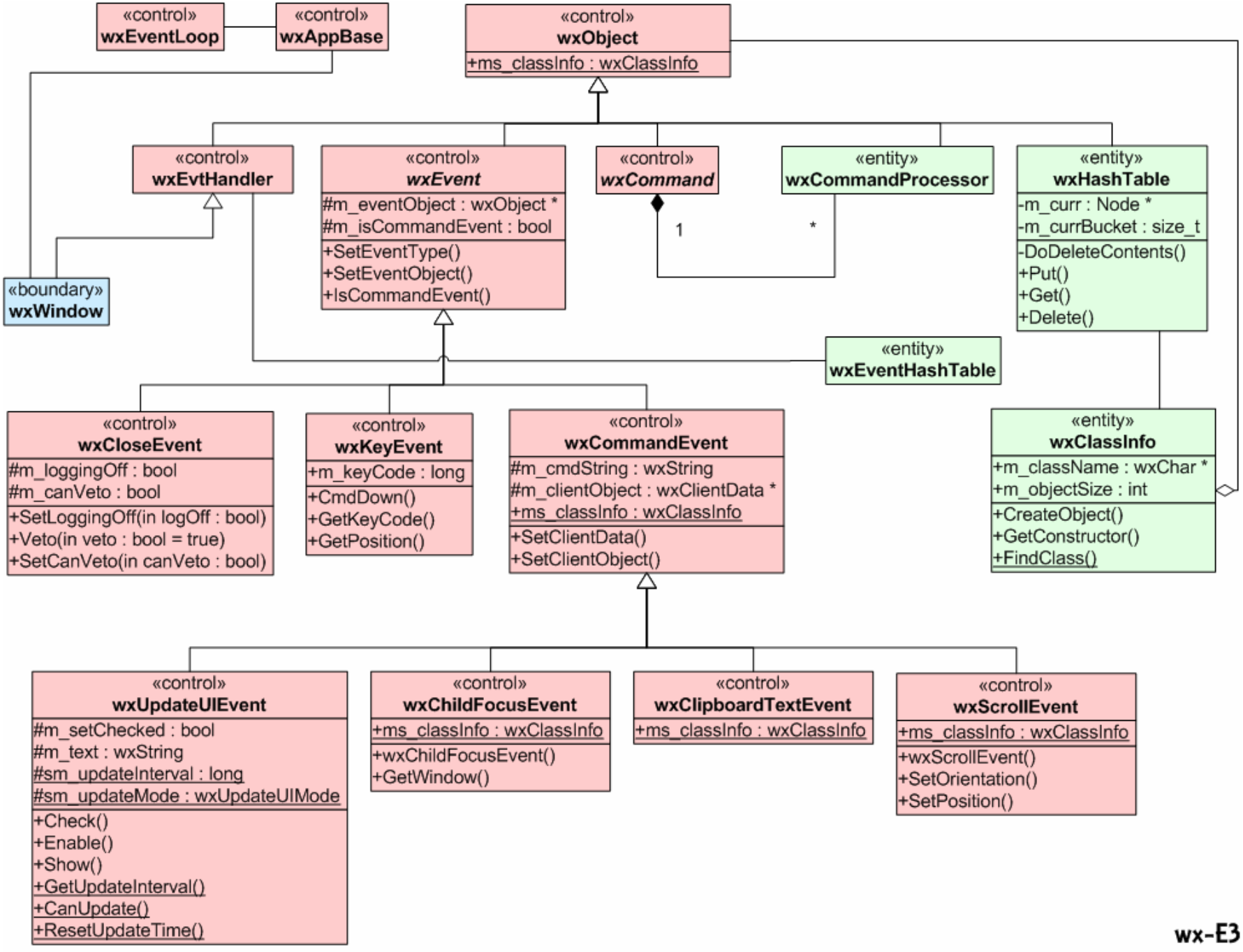


wx-E1

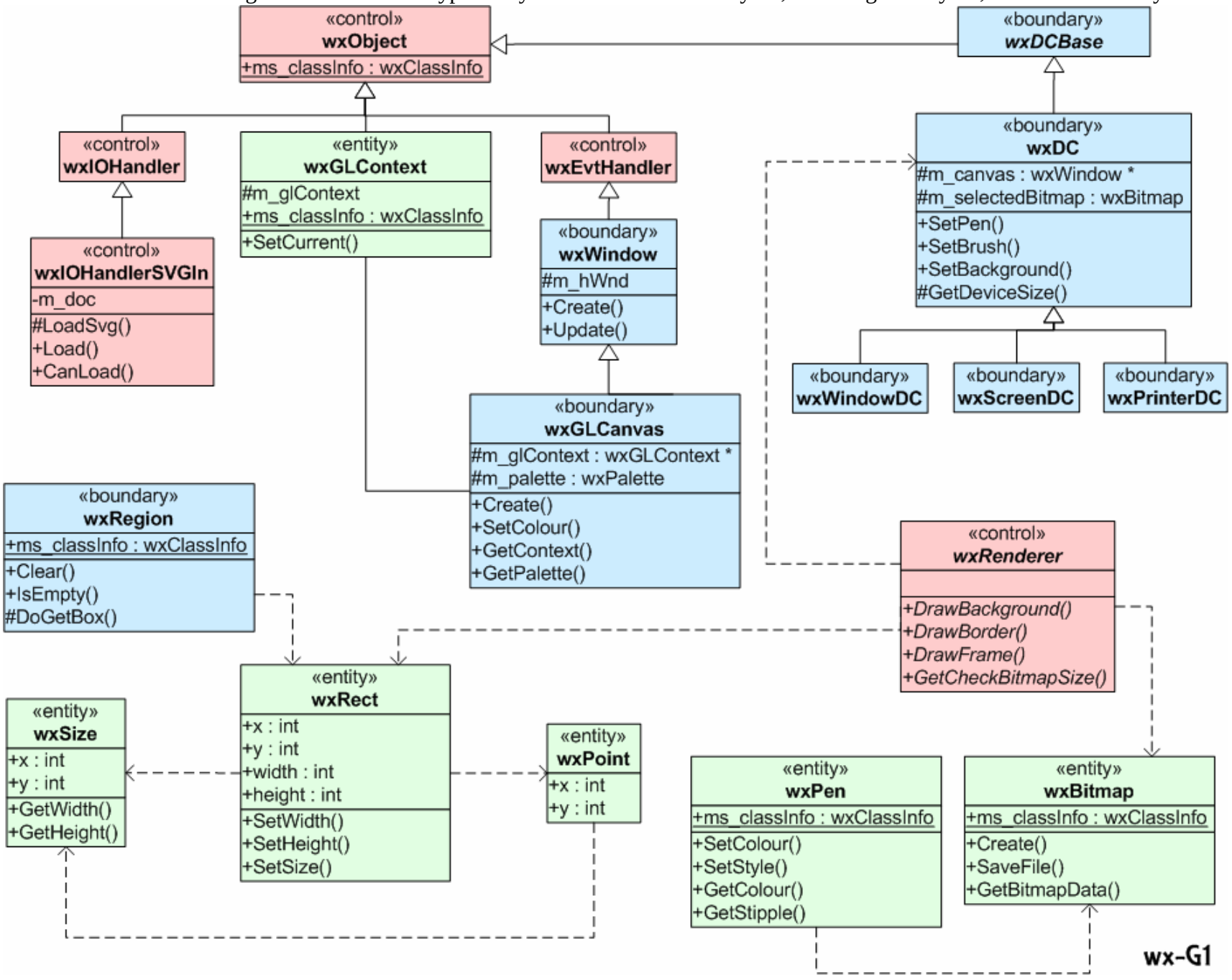
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



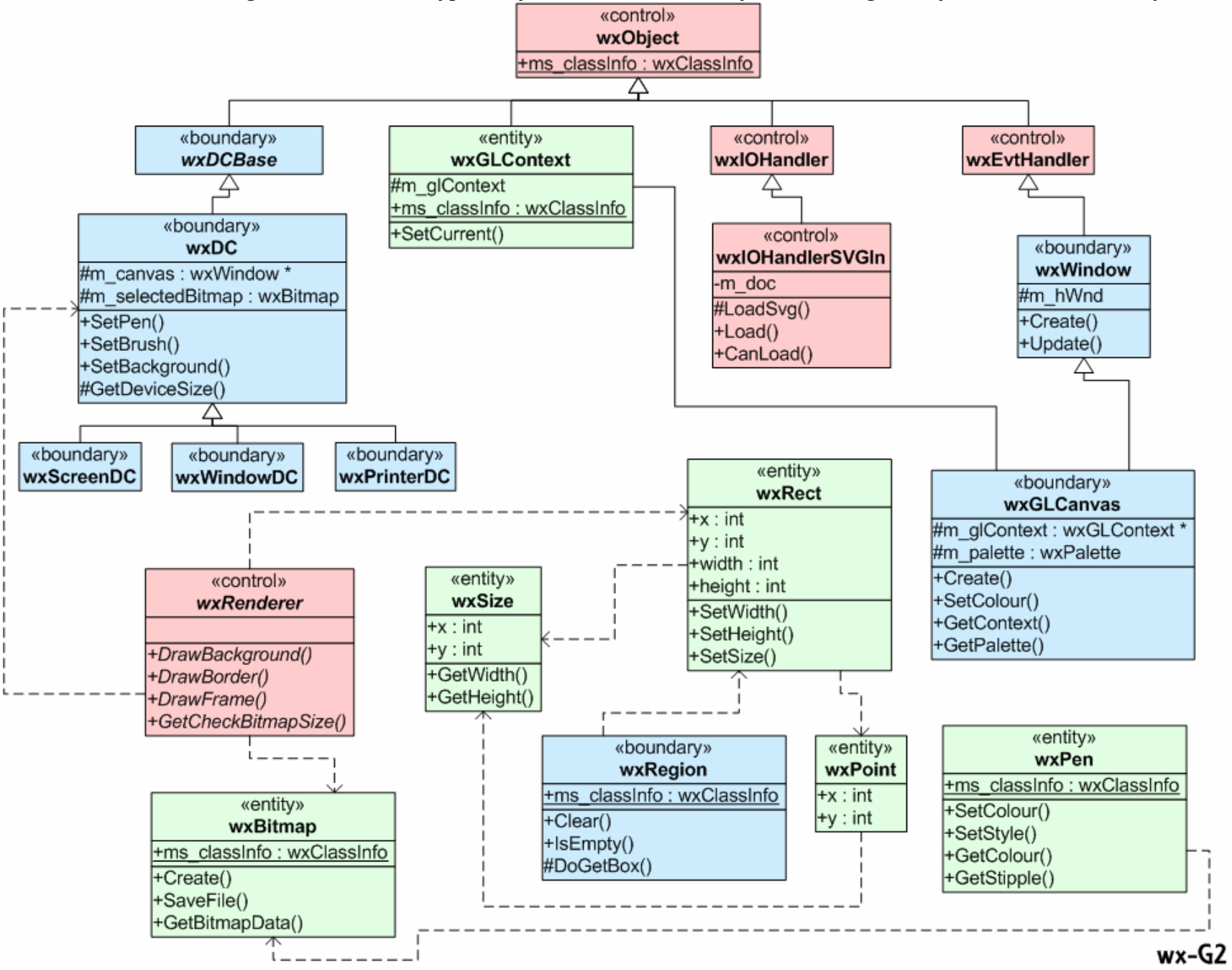
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



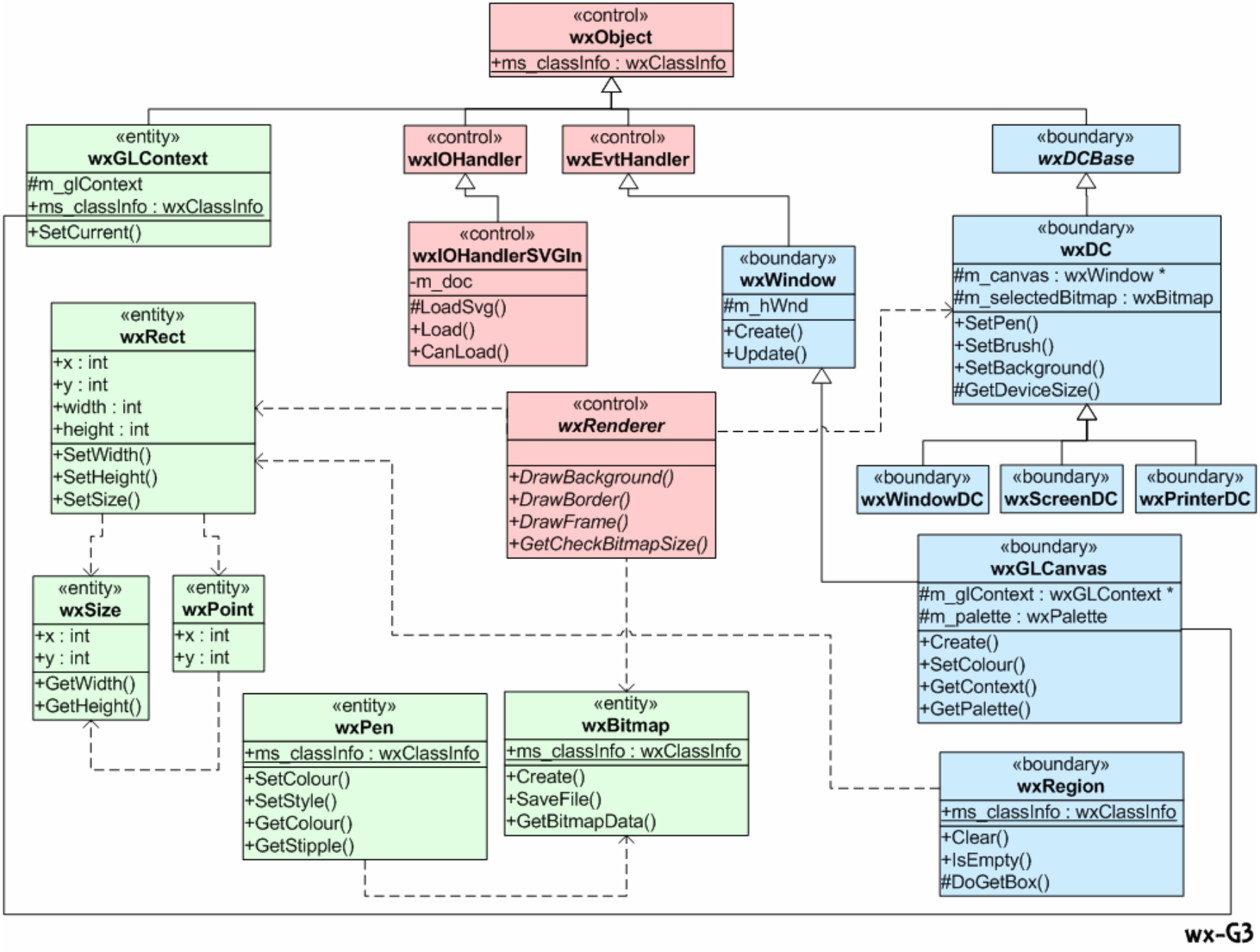
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



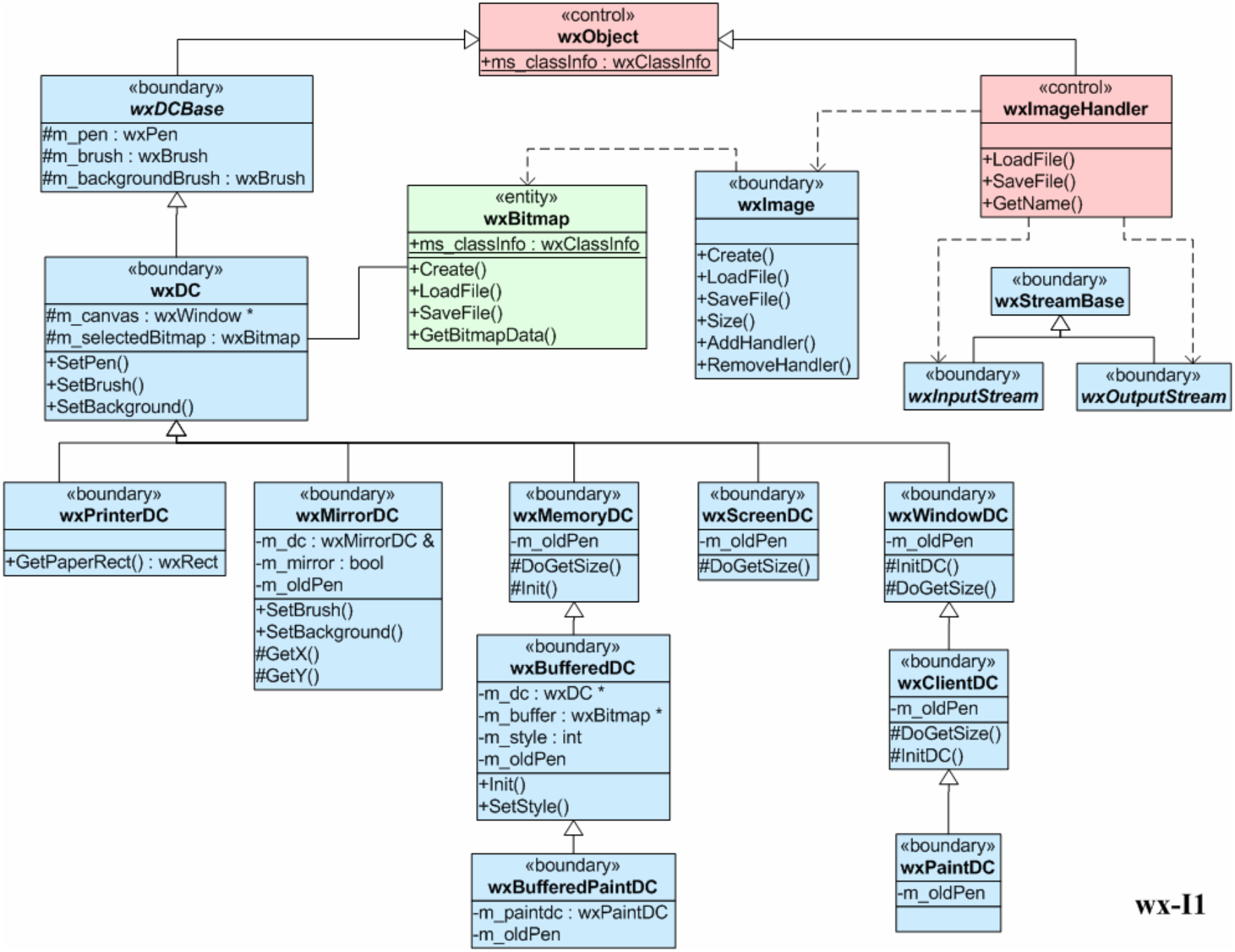
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

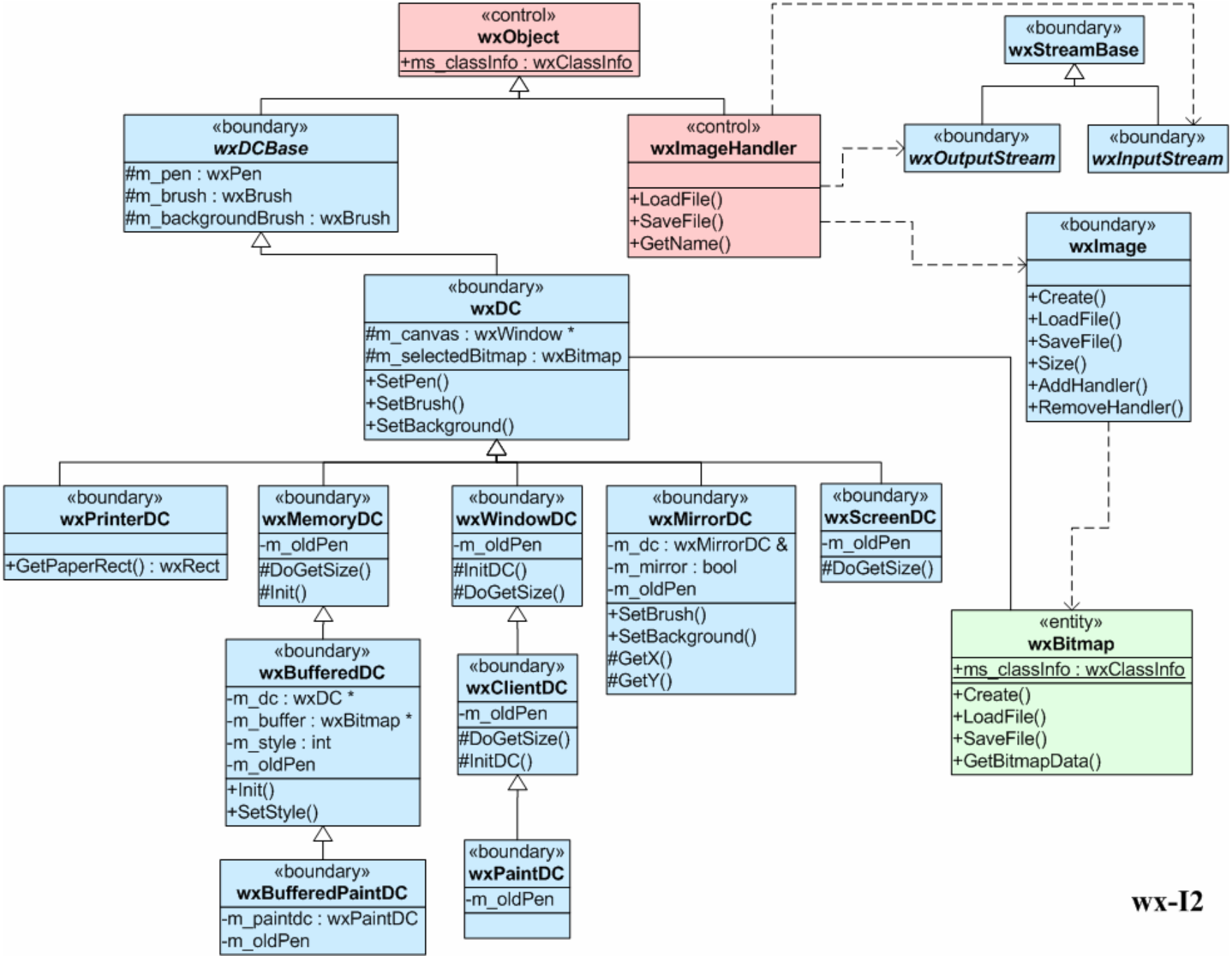


The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

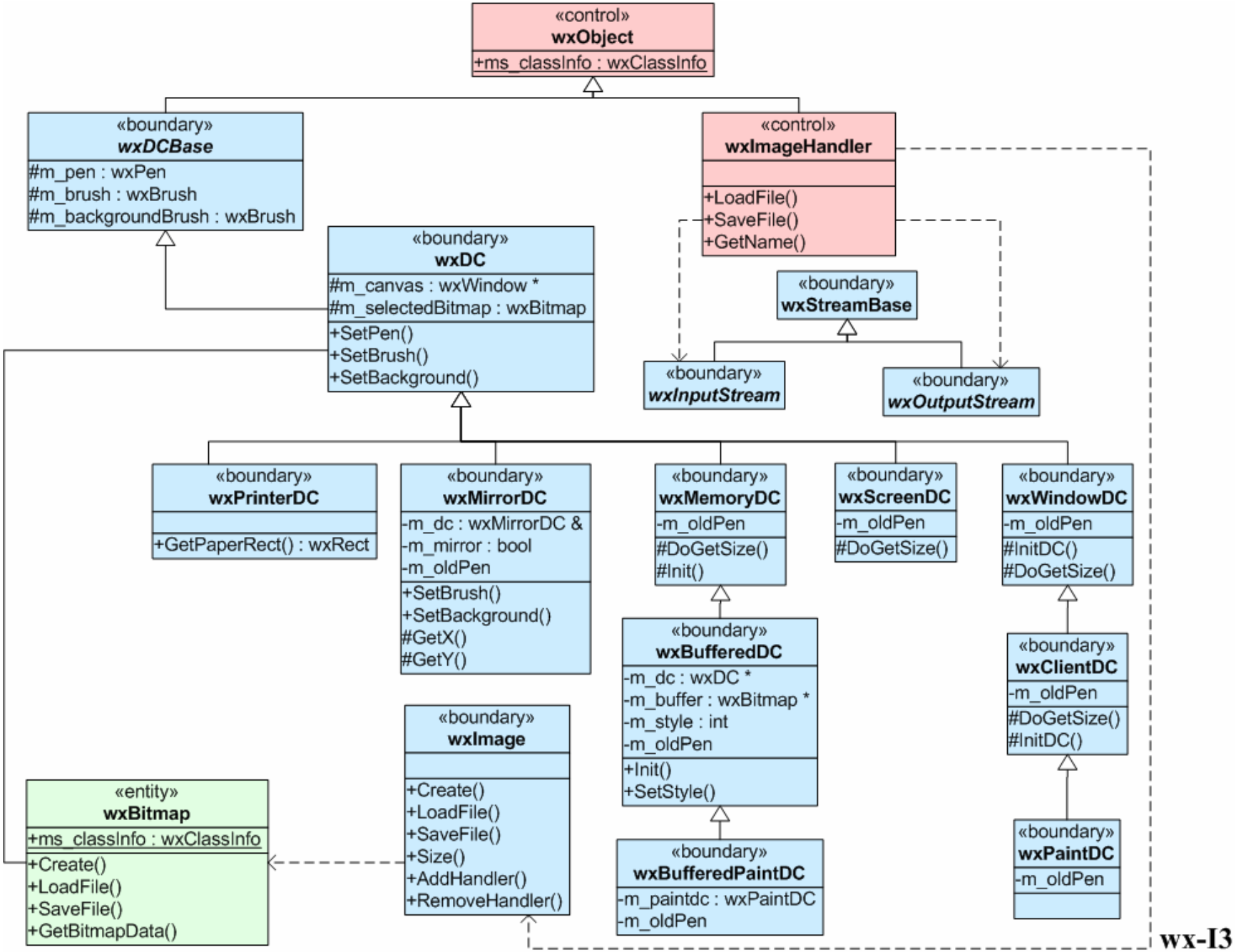


wx-I1

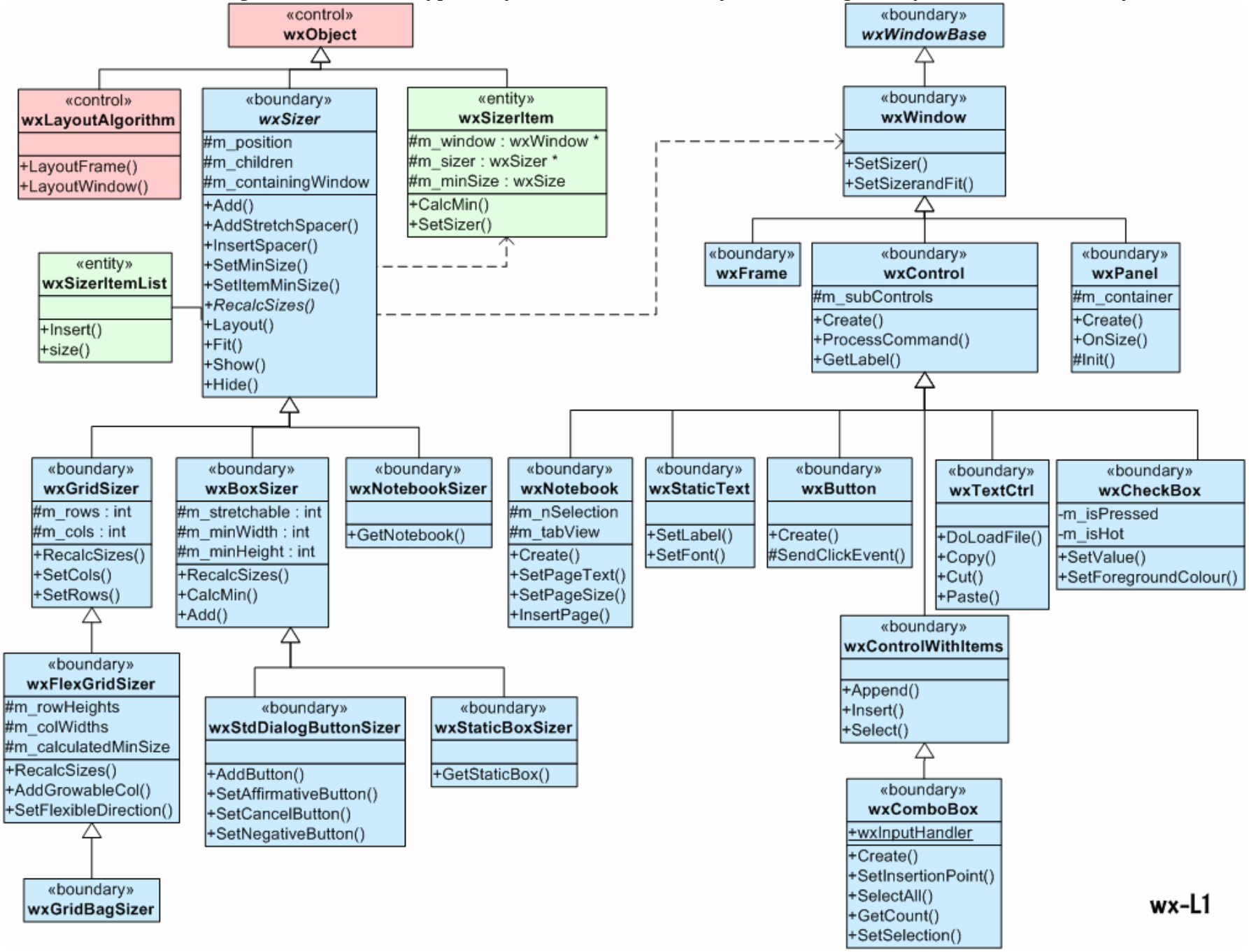
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



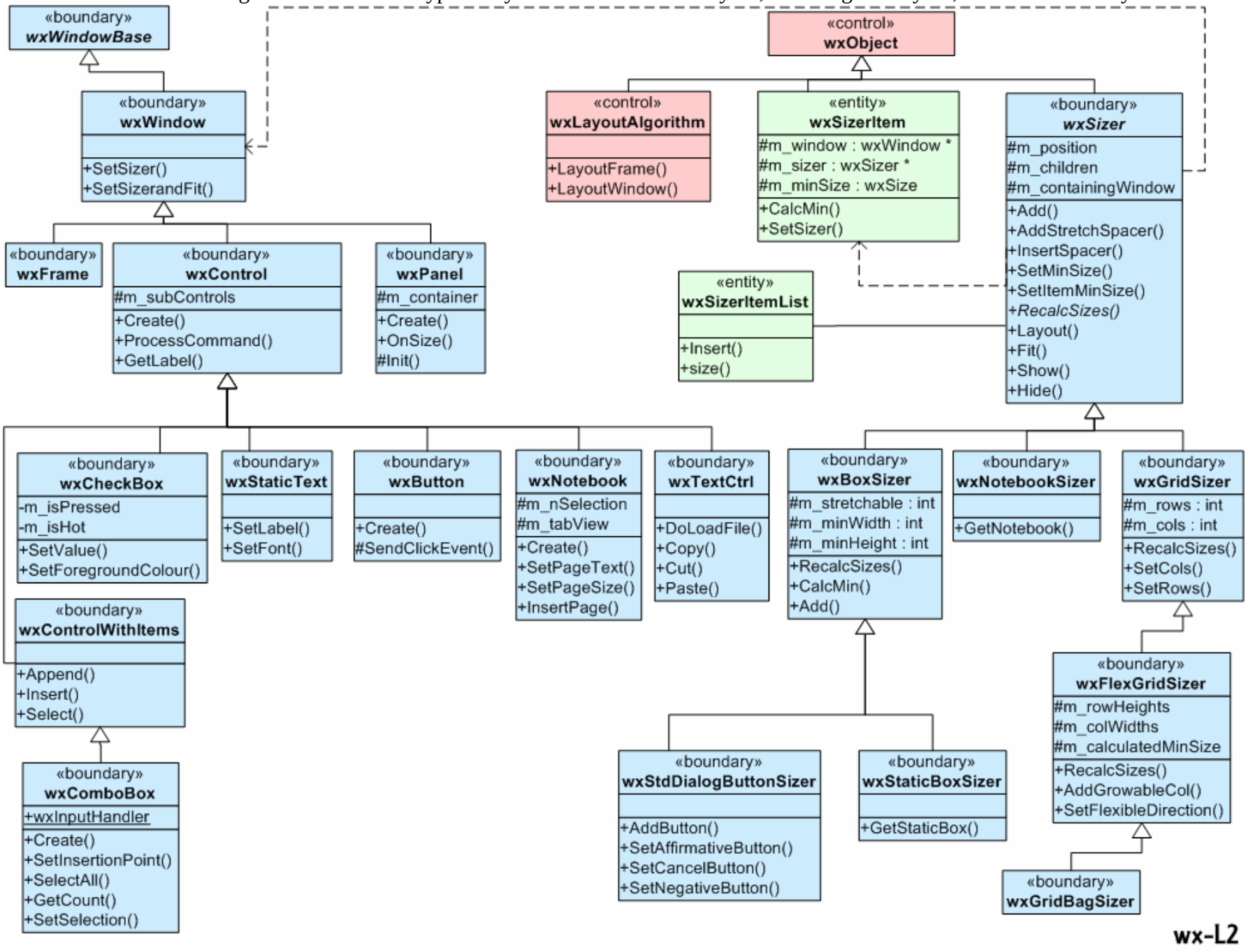
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



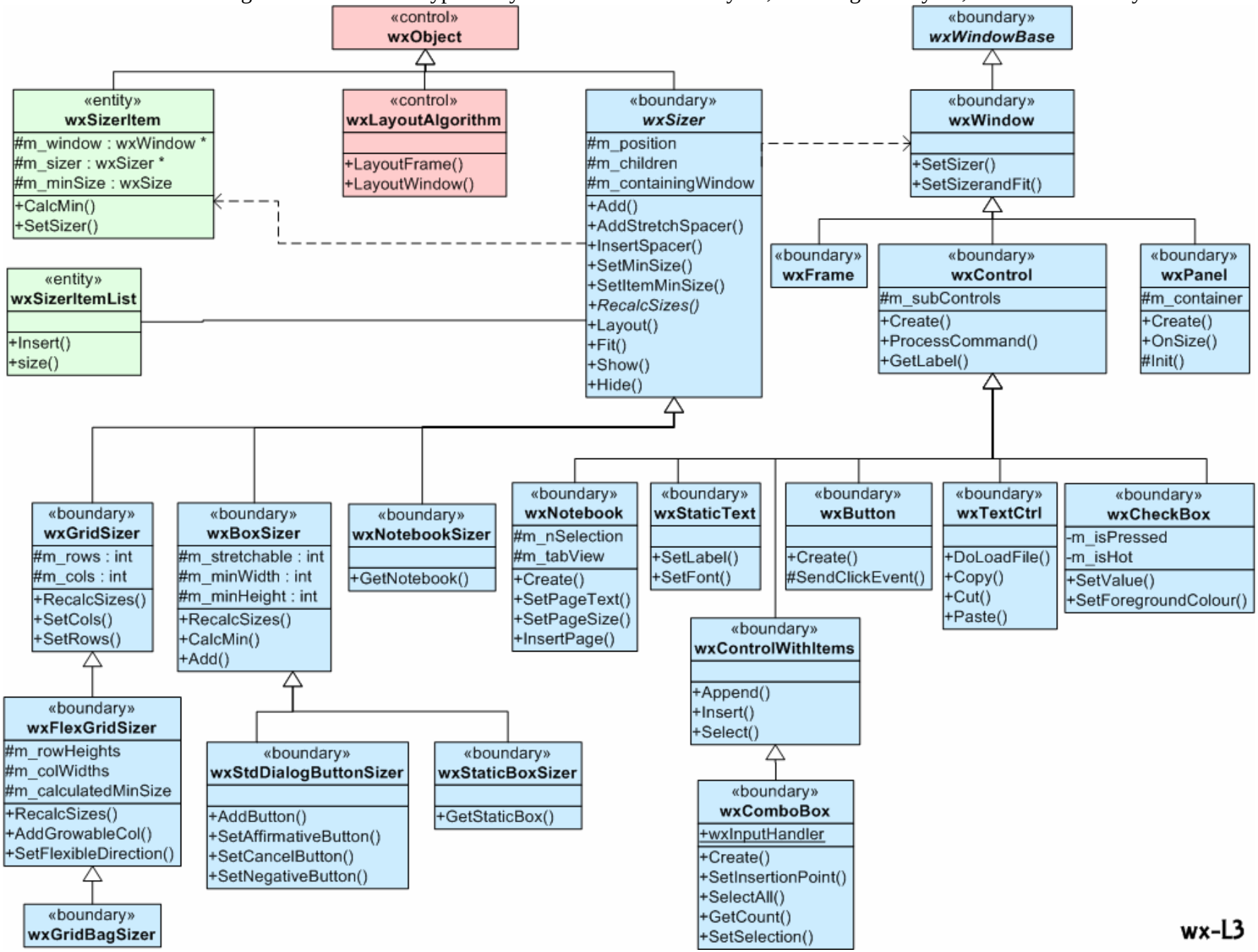
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



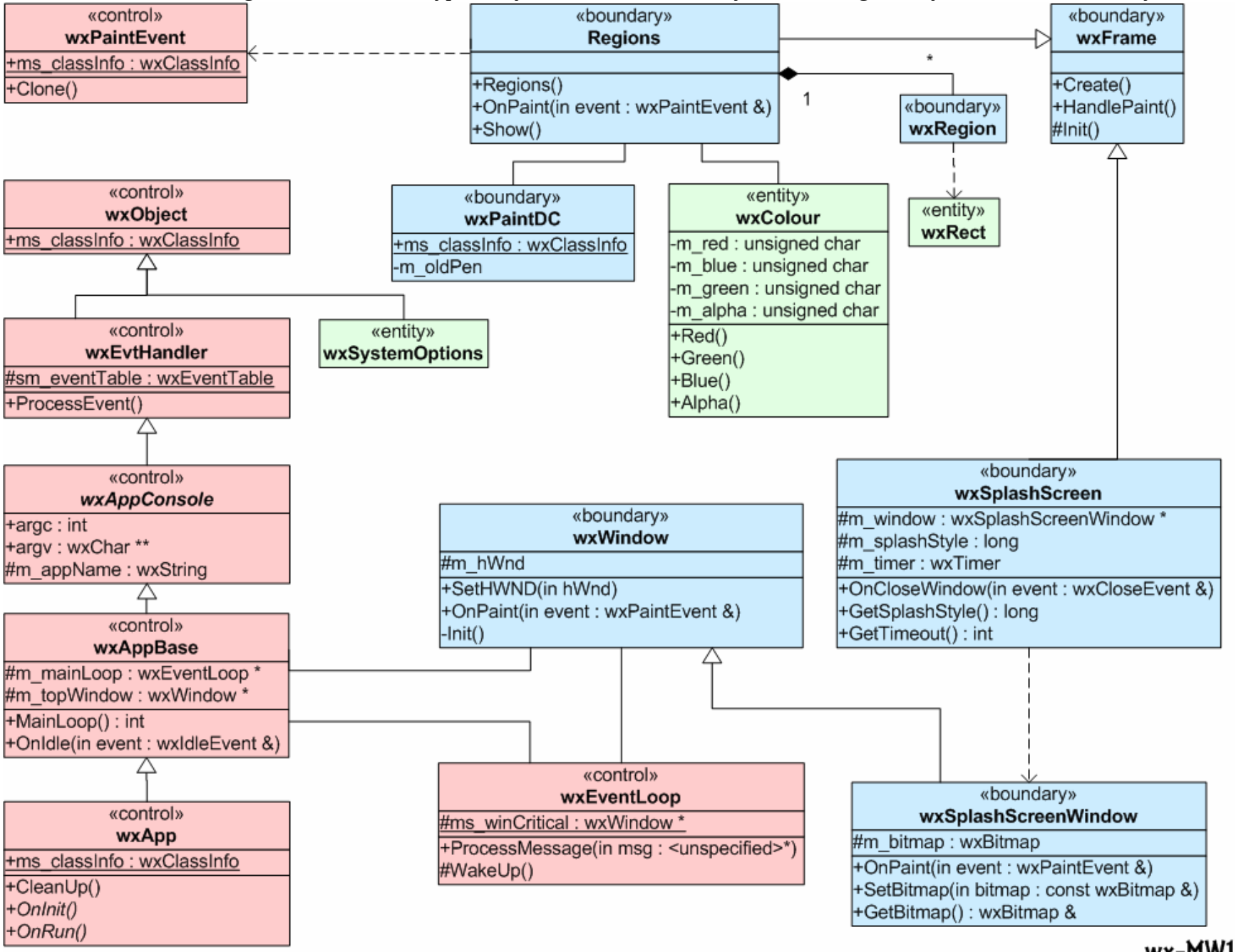
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

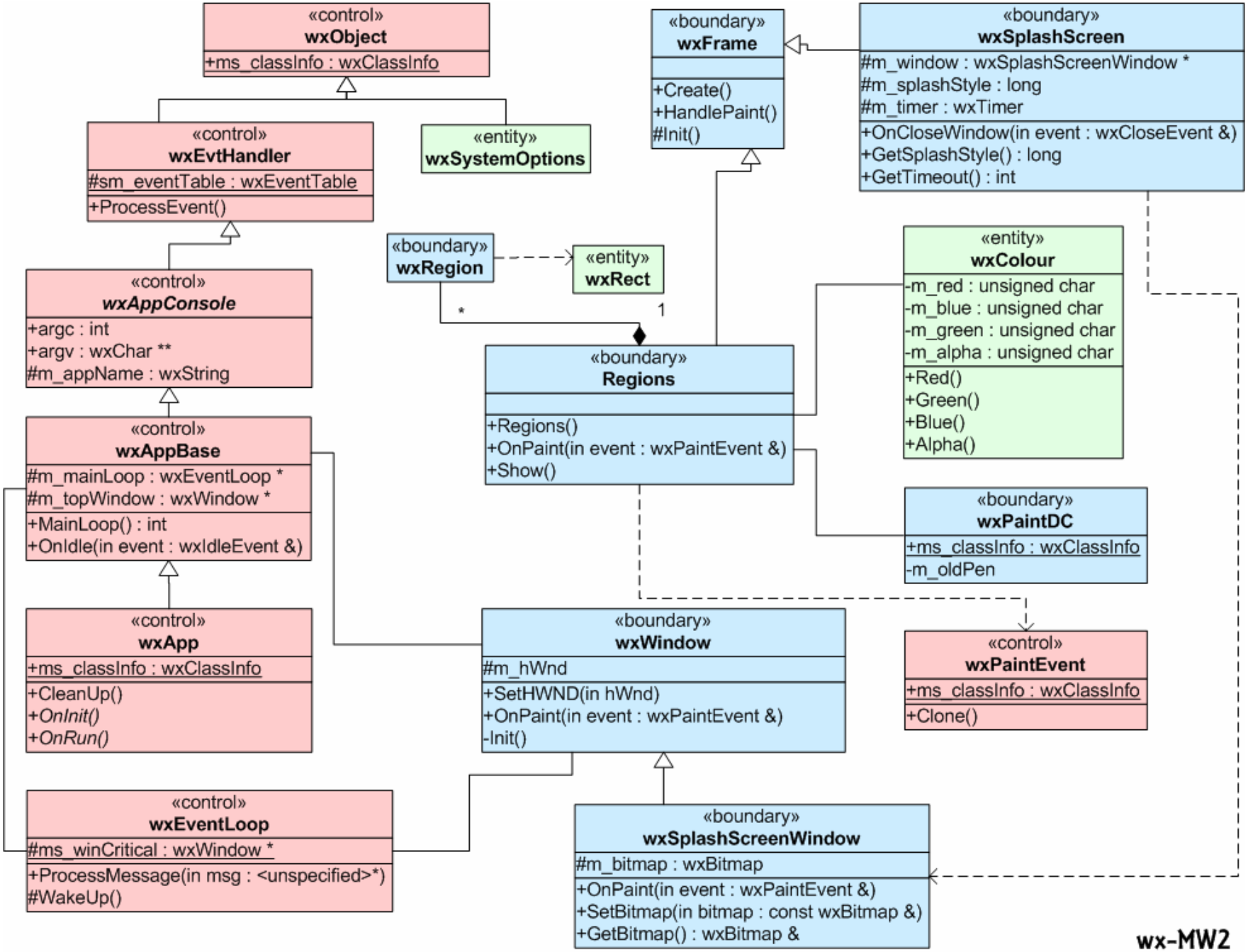


The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout

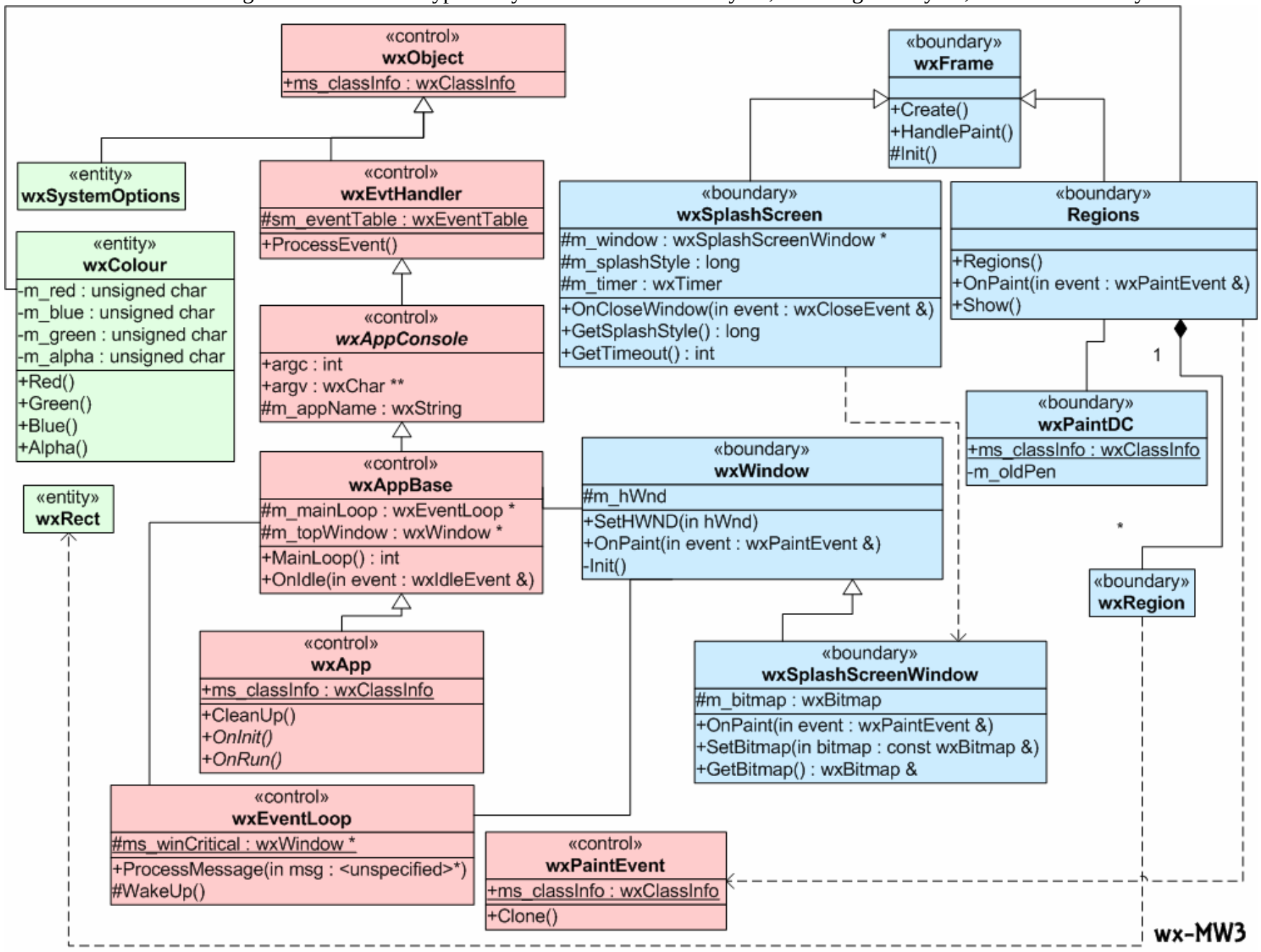


wx-MW1

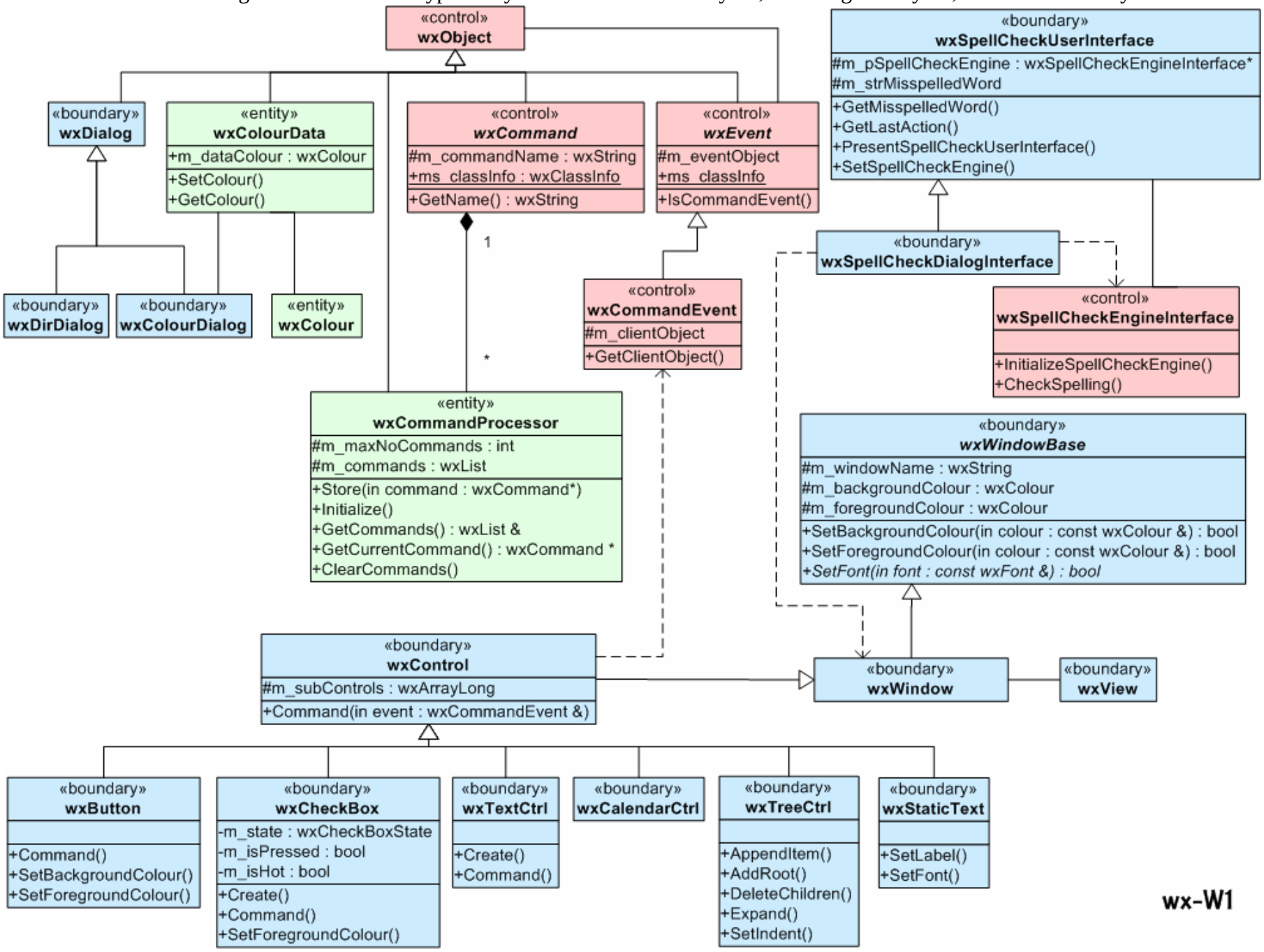
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



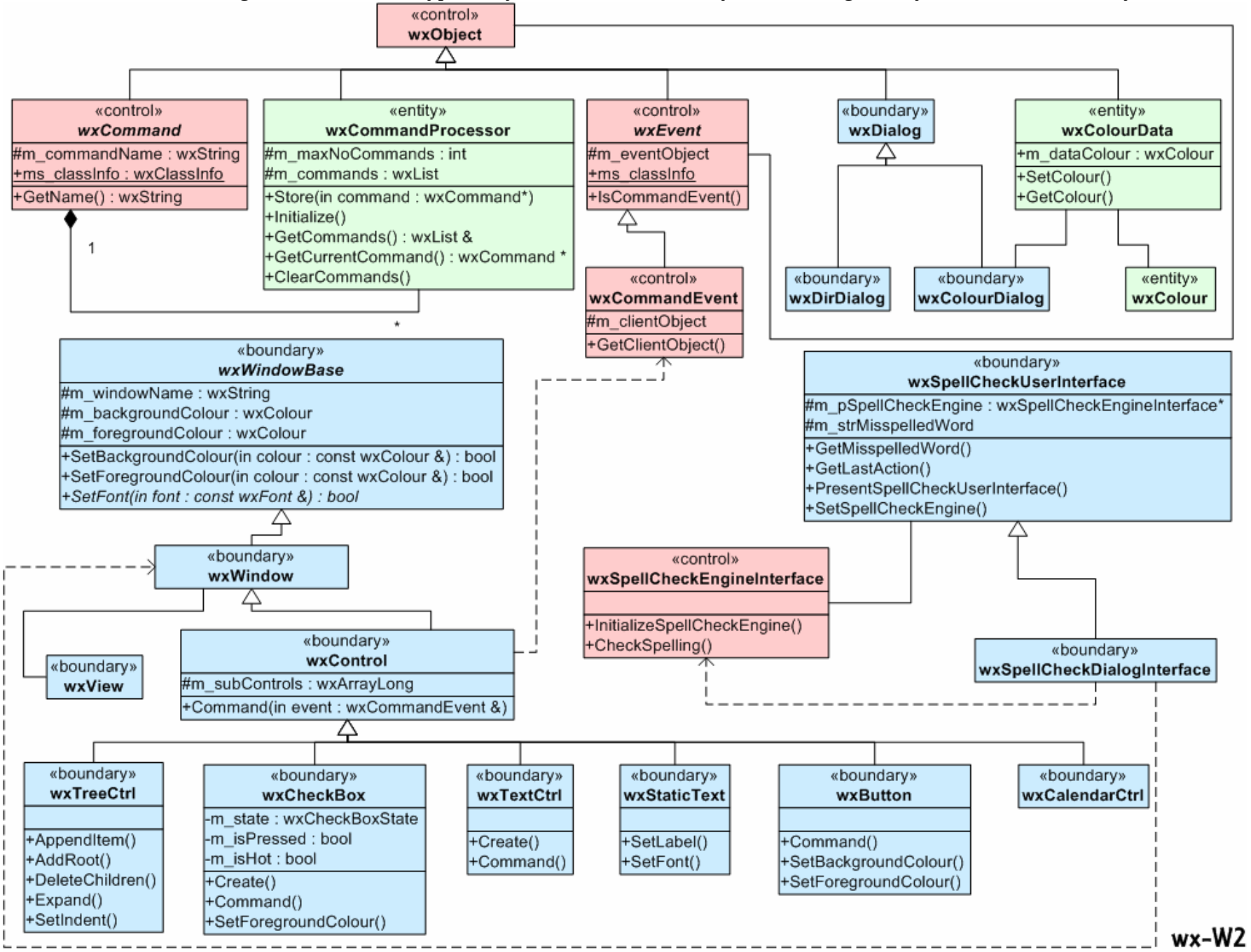
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



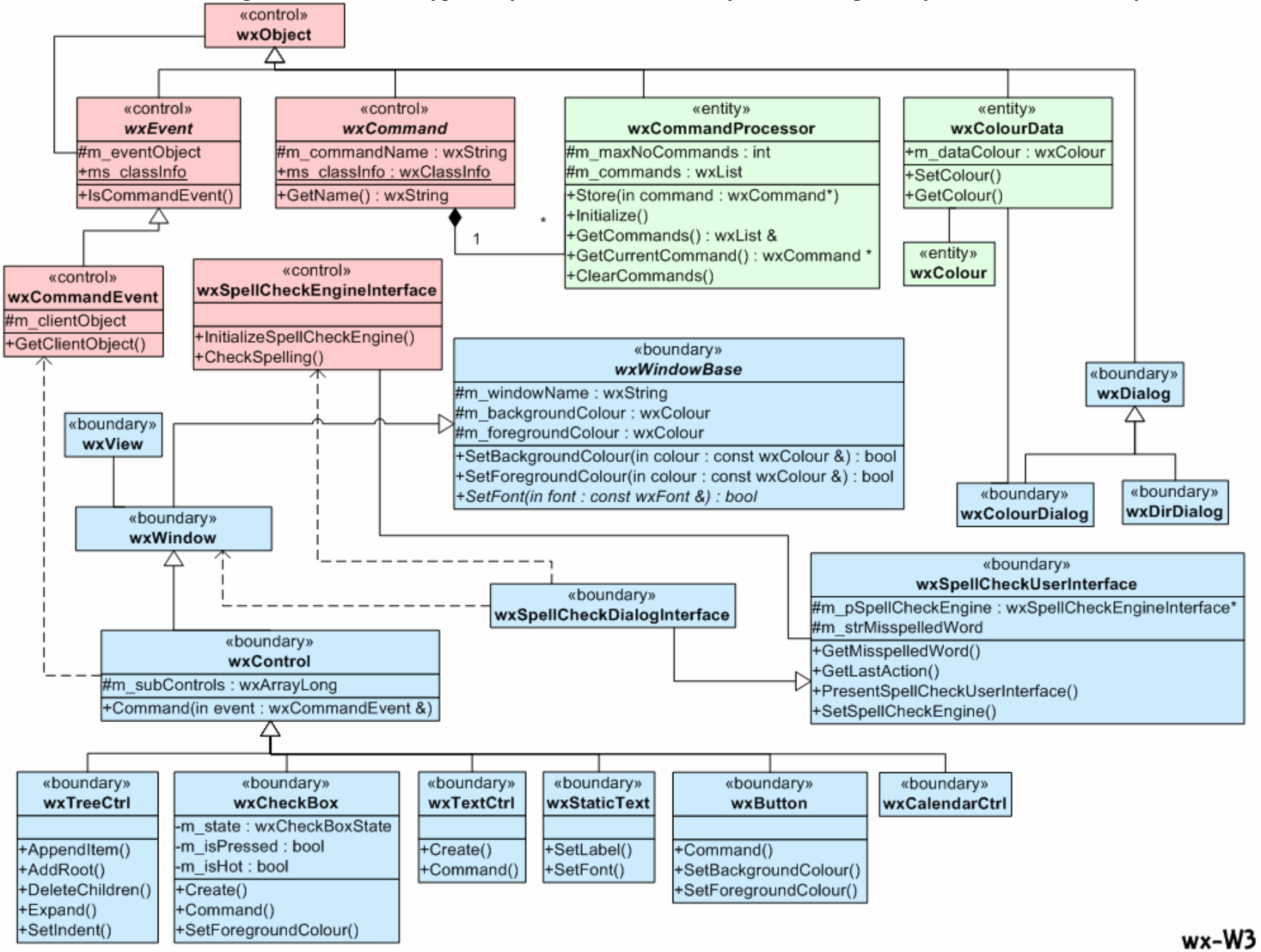
The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



The last number of the diagram id denotes the type of layout: 1= multi cluster layout, 2=orthogonal layout, 3=three-cluster layout



wx-W3