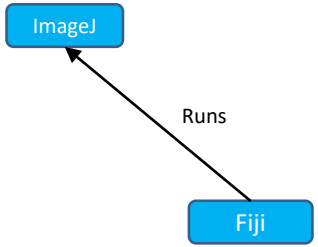
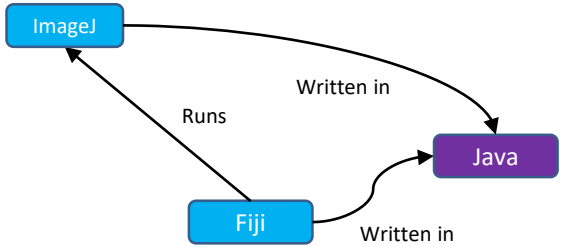
Fiji Workshop

BIO-410

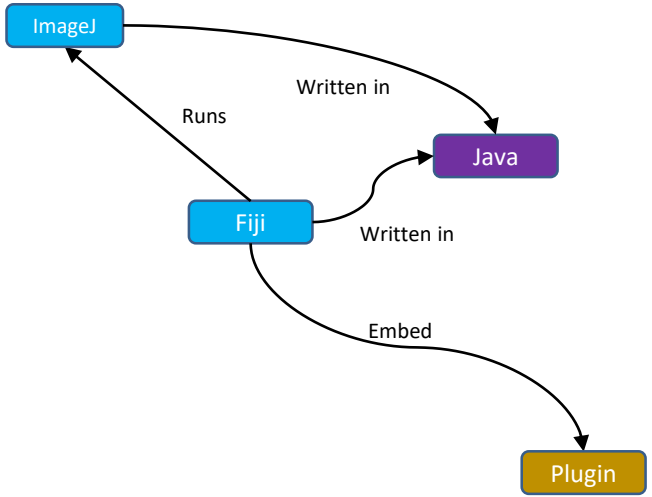
- Fiji is just ImageJ



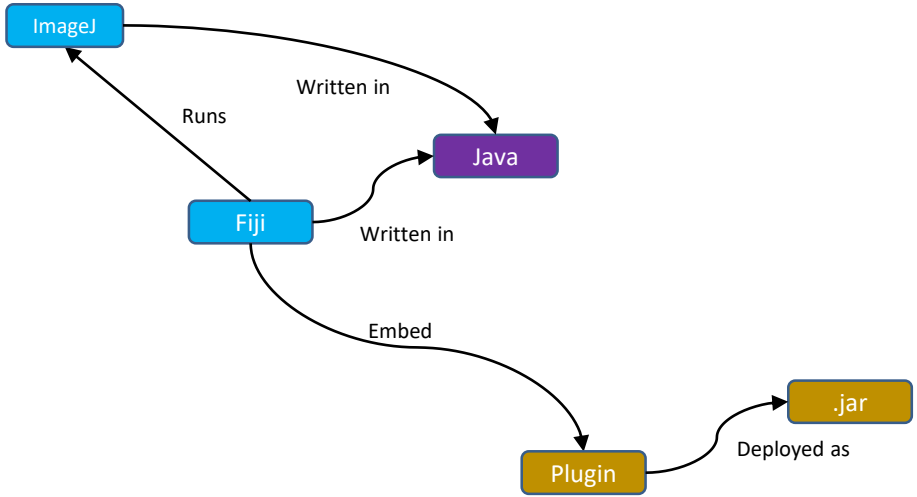
- Fiji is just ImageJ
- Written in Java



- Fiji is just ImageJ
- Written in Java
- With many plugins embedded

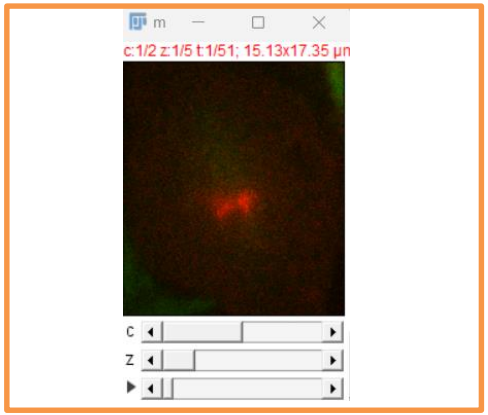


- Fiji is just ImageJ
- Written in Java
- With many plugins embedded
- .jar = zip (Java archive)

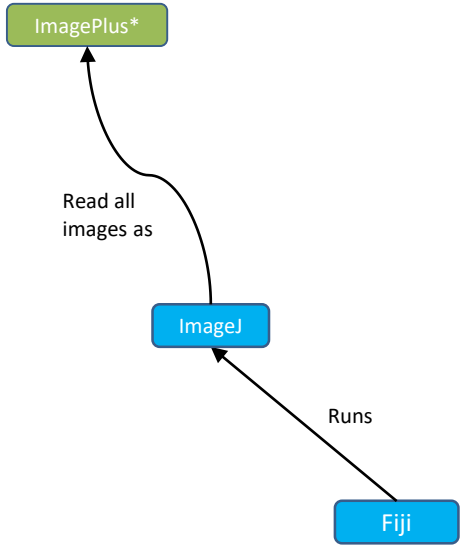


Main Fiji Objects

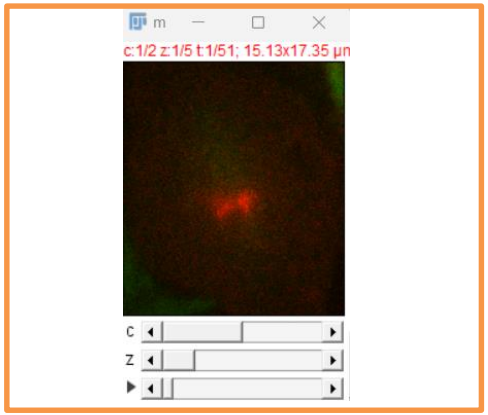
ImagePlus

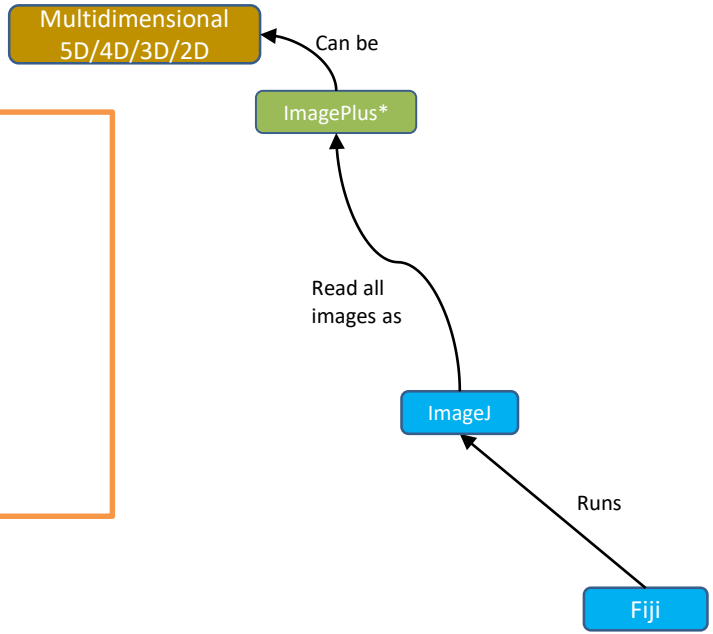


ImagePlus object



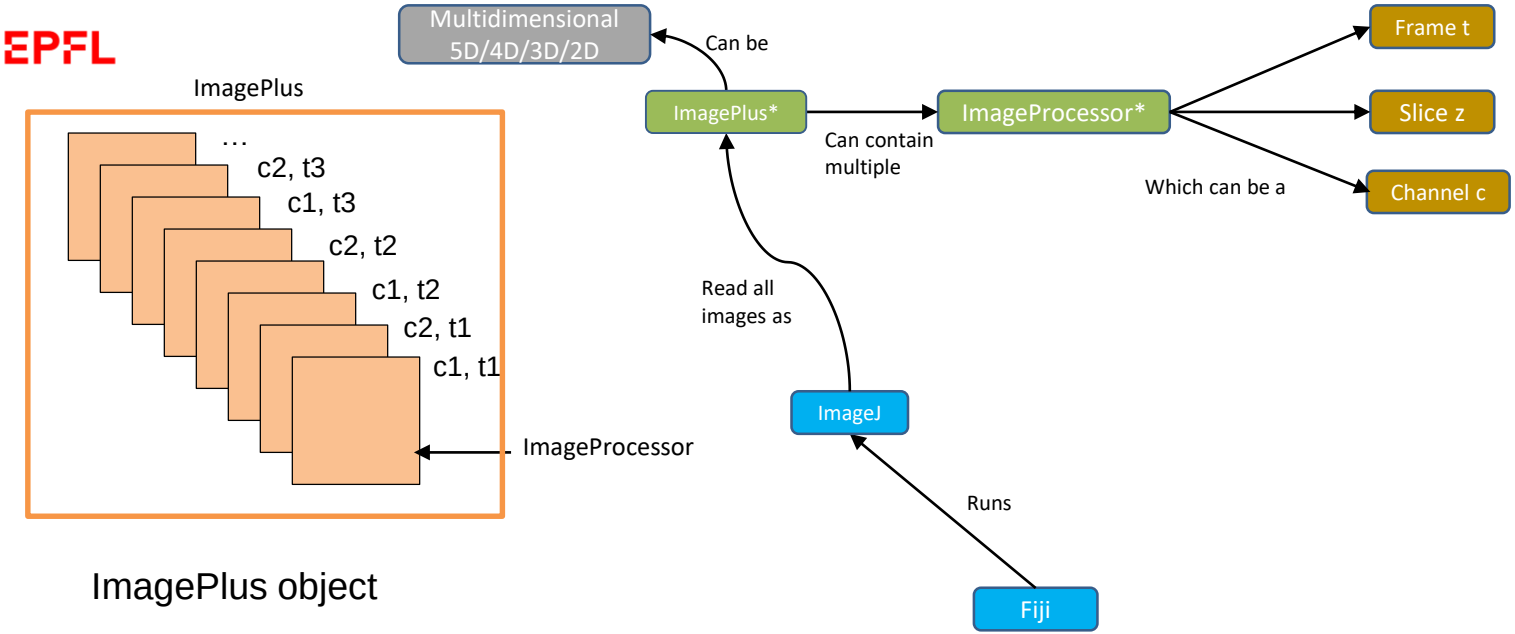
ImagePlus





ImagePlus object

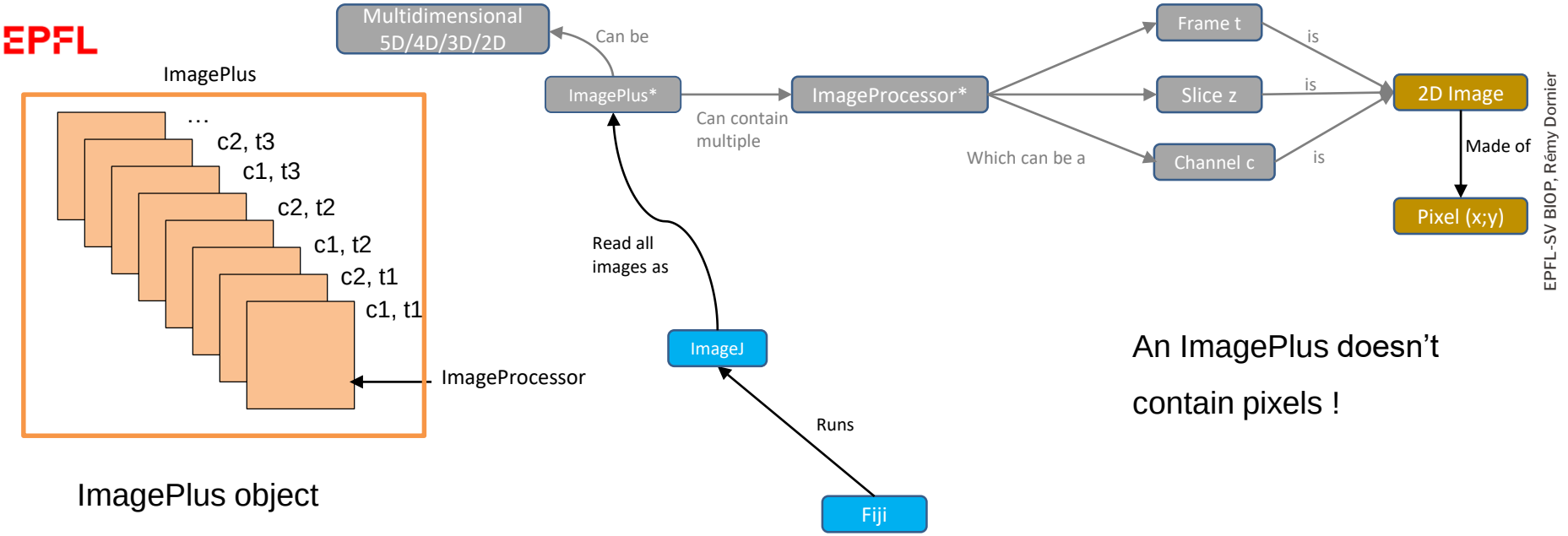
- High-level objects to encapsulate all images



ImagePlus object

- High-level objects to encapsulate all images
- Contains multiple images in a certain order

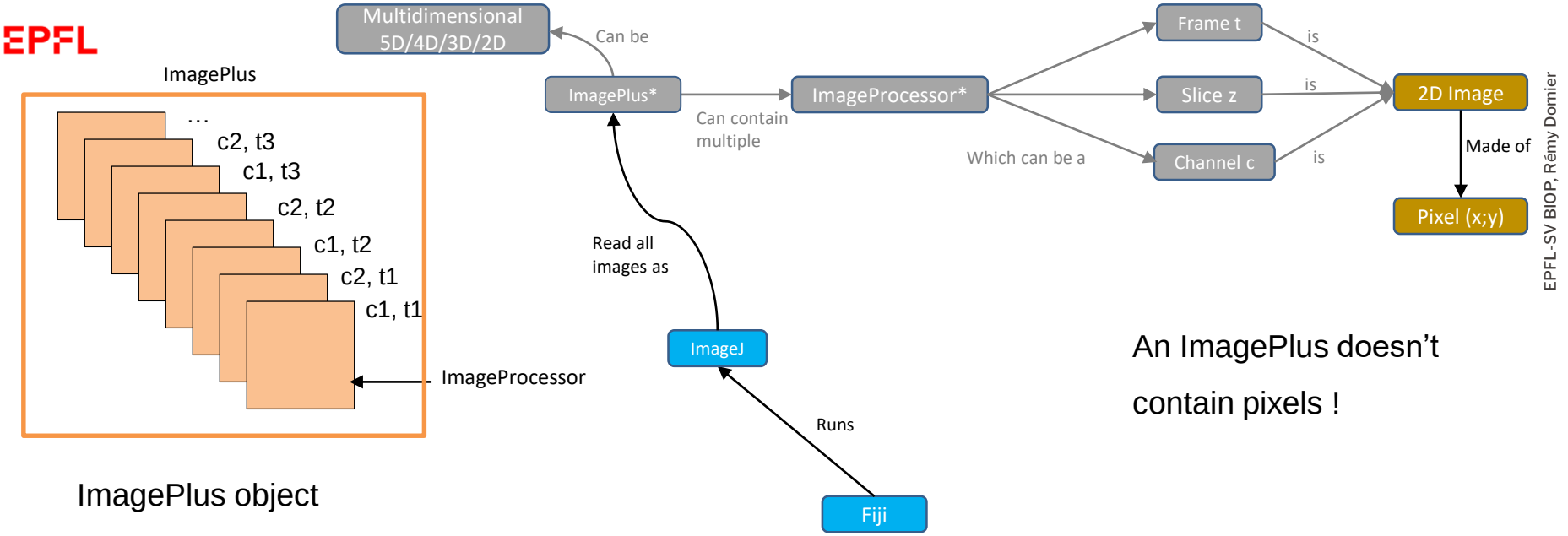
  (c, z, t)



An ImagePlus doesn't contain pixels !

ImagePlus object

- High-level objects to encapsulate all images
- Contains multiple images in a certain order (c, z, t)

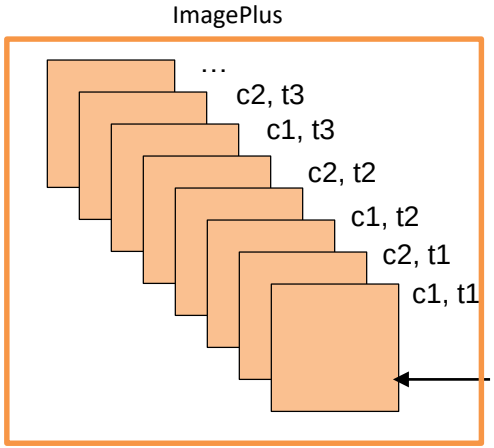


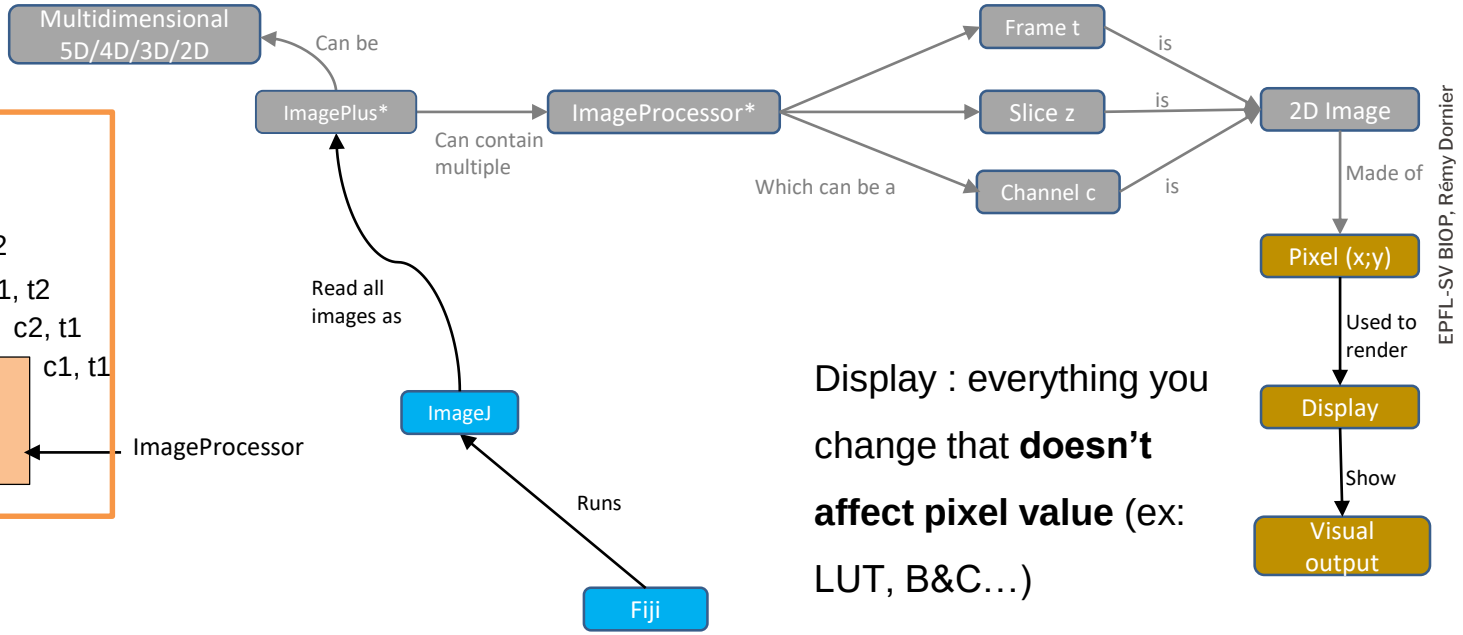
An ImagePlus doesn't contain pixels !

ImagePlus object

- High-level objects to encapsulate all images
- Contains multiple images in a certain order (c, z, t)

XY: Zero-based index origin
CZT: One-based index origin

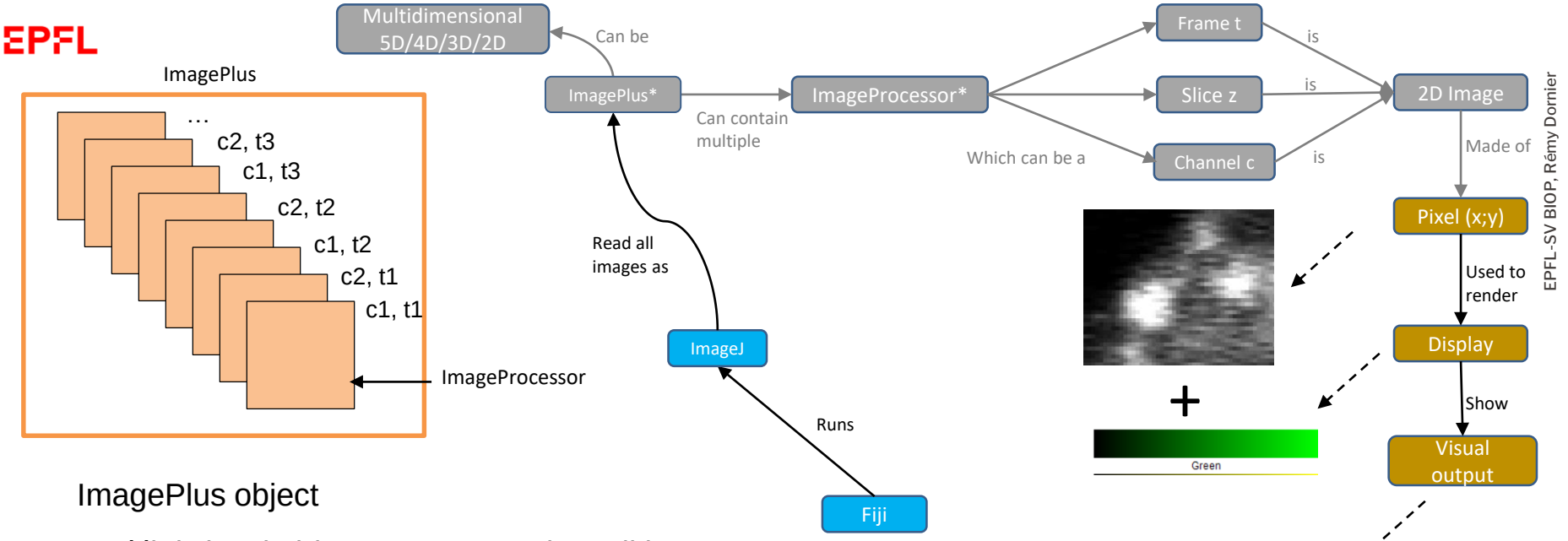




Display : everything you change that **doesn't affect pixel value** (ex: LUT, B&C…)

ImagePlus object

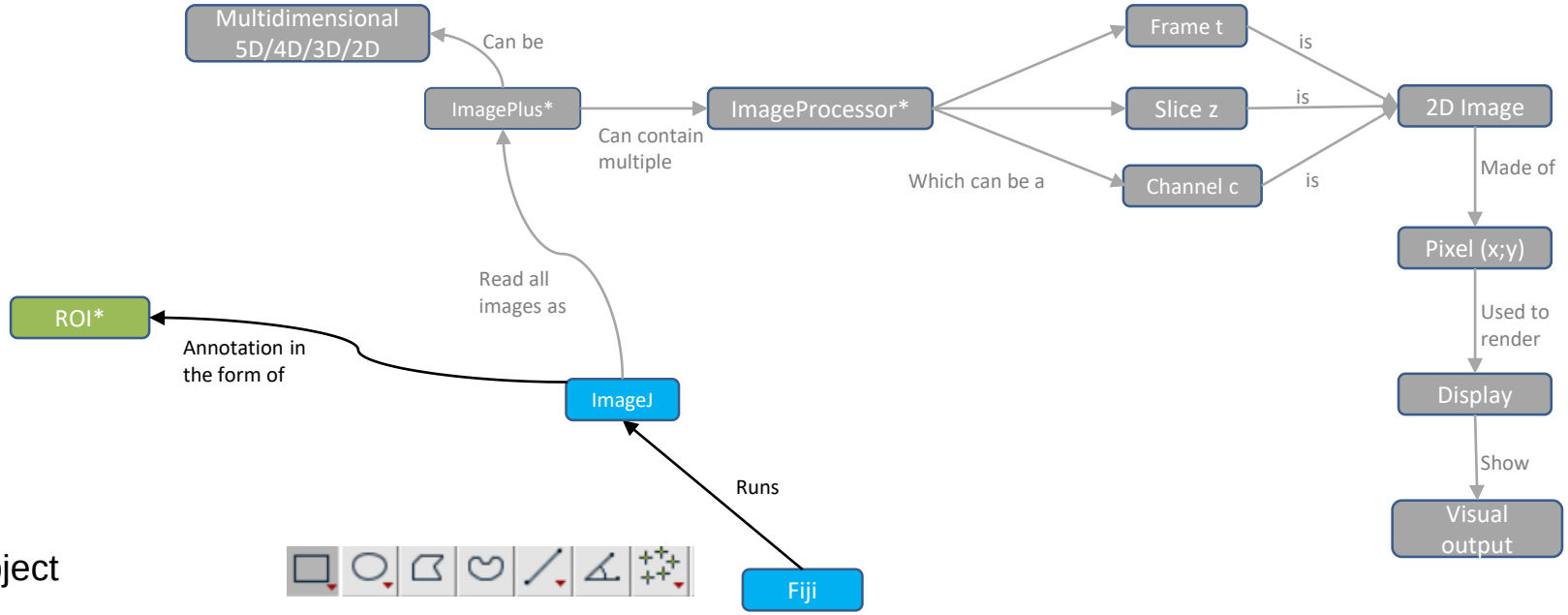
- High-level objects to encapsulate all images
- Contains multiple images in a certain order (c, z, t)



ImagePlus object

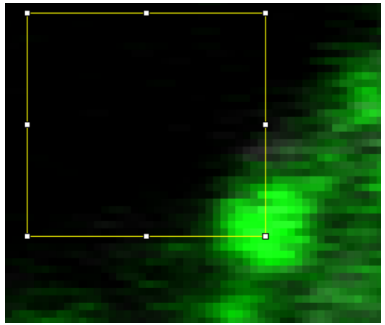
- High-level objects to encapsulate all images
- Contains multiple images in a certain order

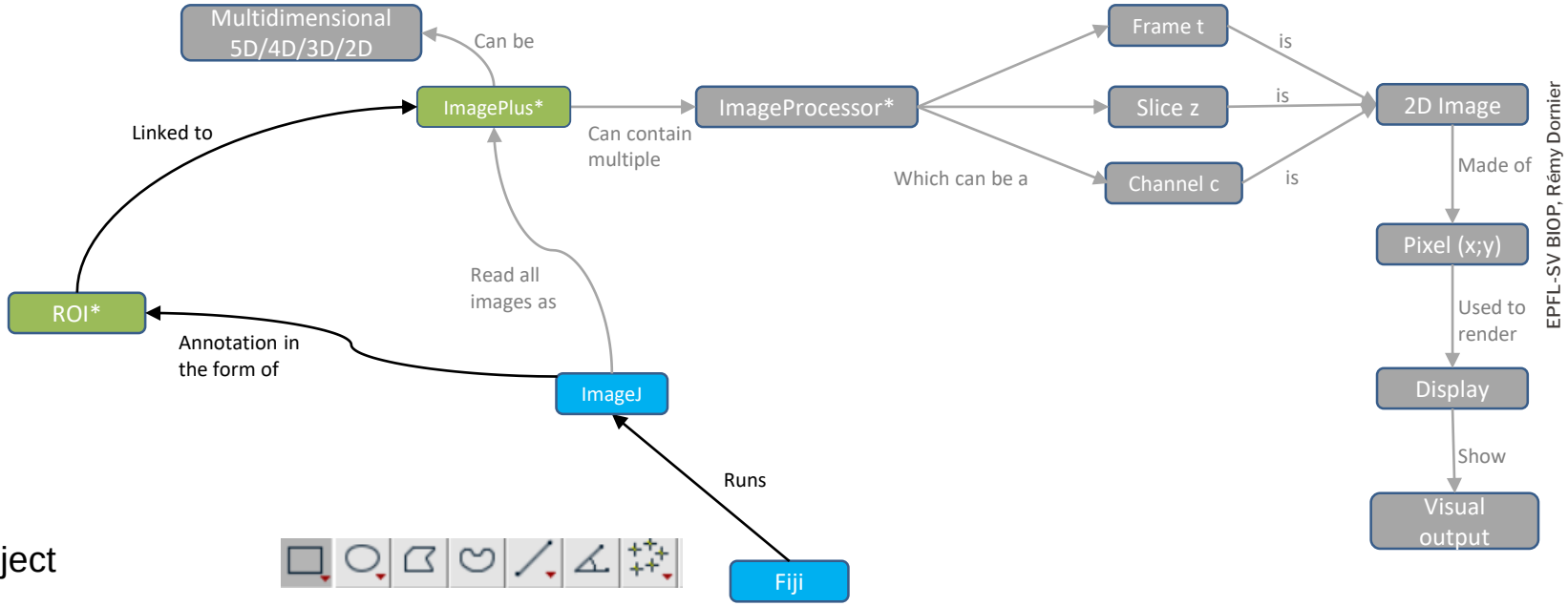
  (c, z, t)



ROI object

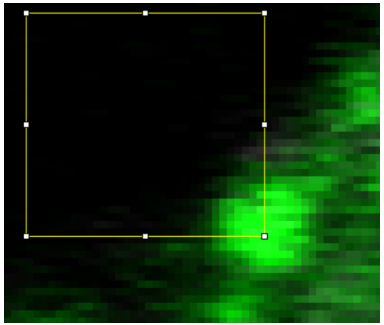
- Drawing annotation

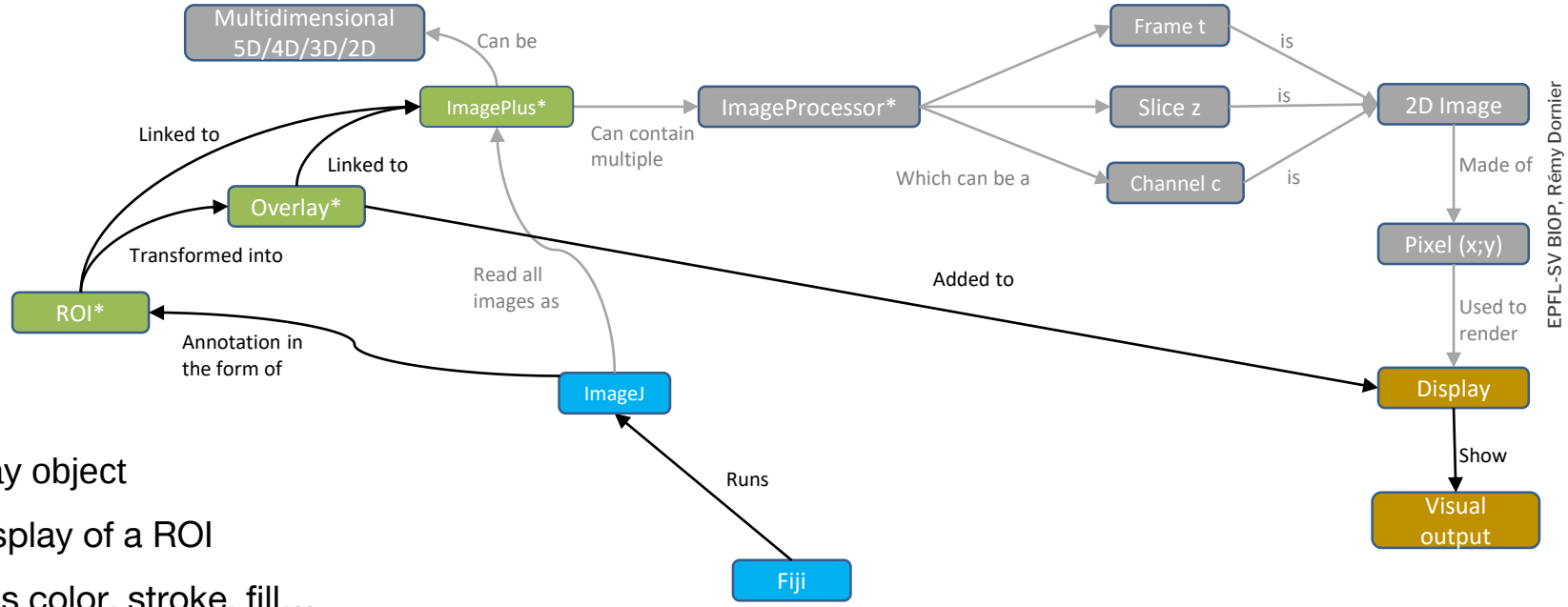




ROI object

- Drawing annotation



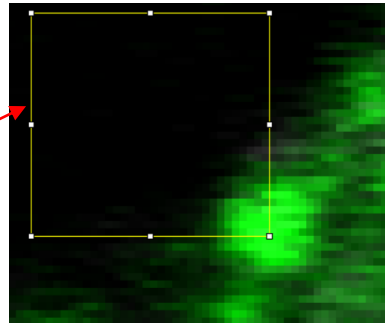


EPFL-SV BIOP, Rémy Dornier

Overlay object

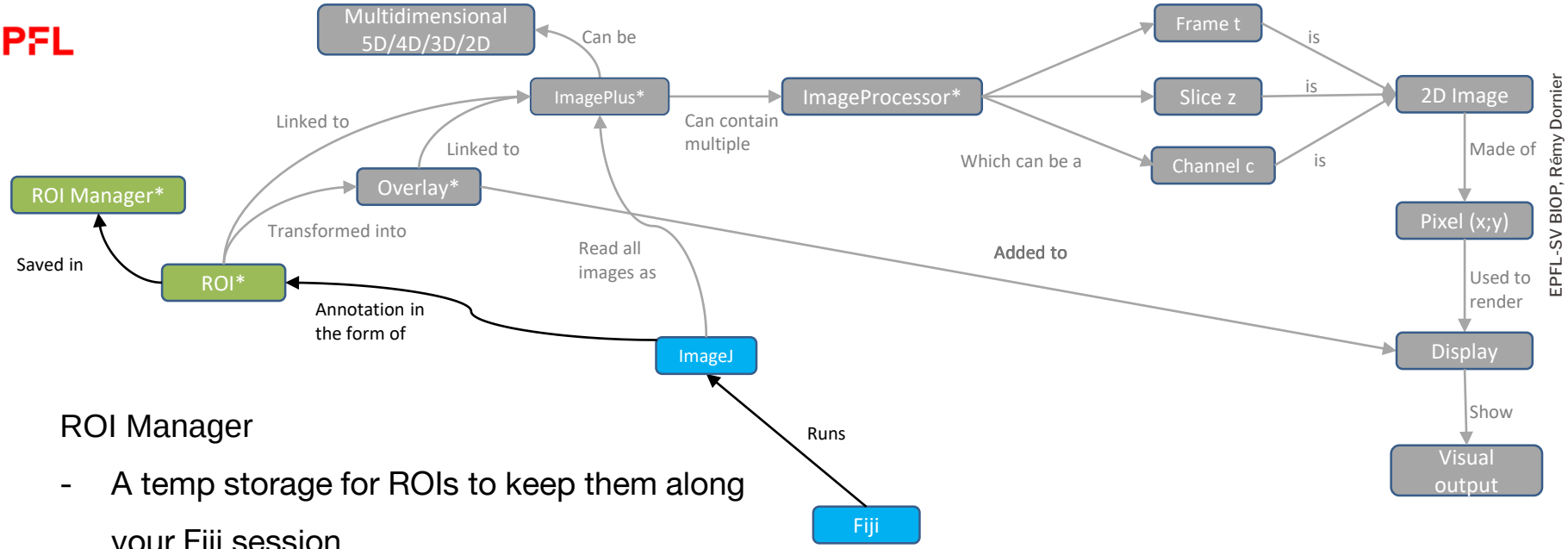
- Display of a ROI
- Has color, stroke, fill…

This is the overlay of the square ROI



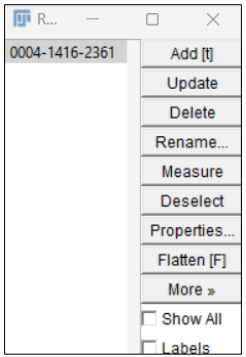
0004-1416-2361.roi

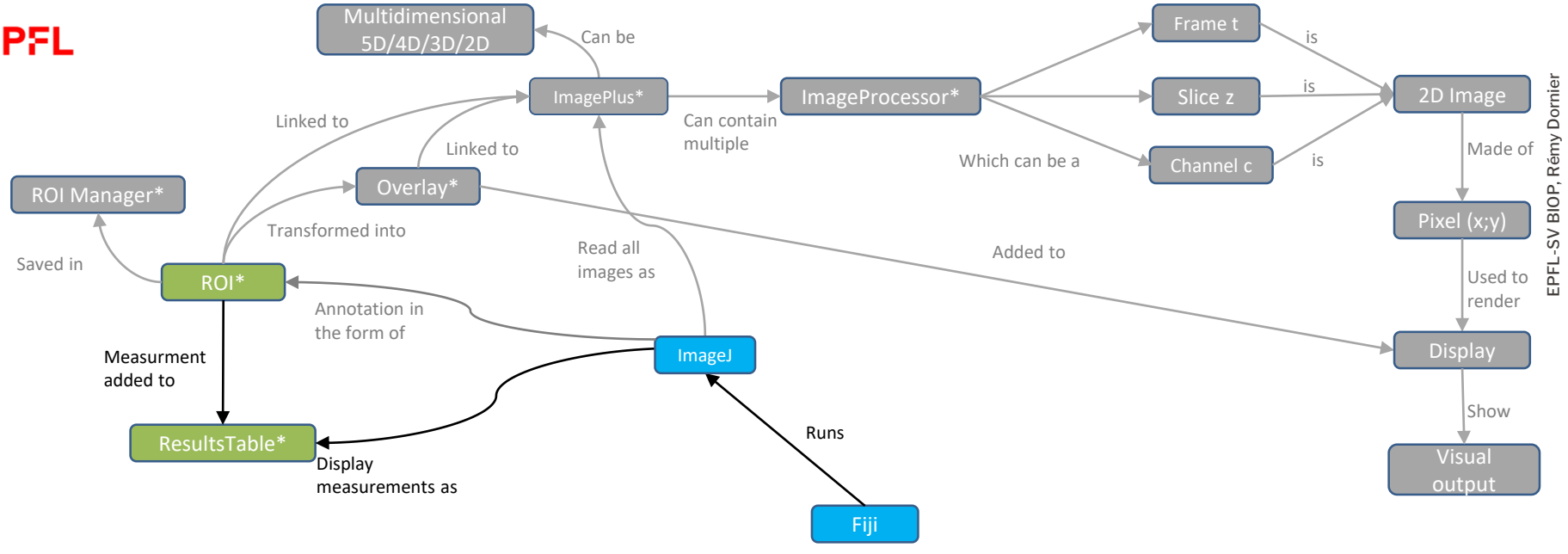
{450, 213, 200, 200}



ROI Manager

- A temp storage for ROIs to keep them along your Fiji session
- GUI to update shapes and their overlay
- To add any ROI to it, press ‘t’ on keyboard

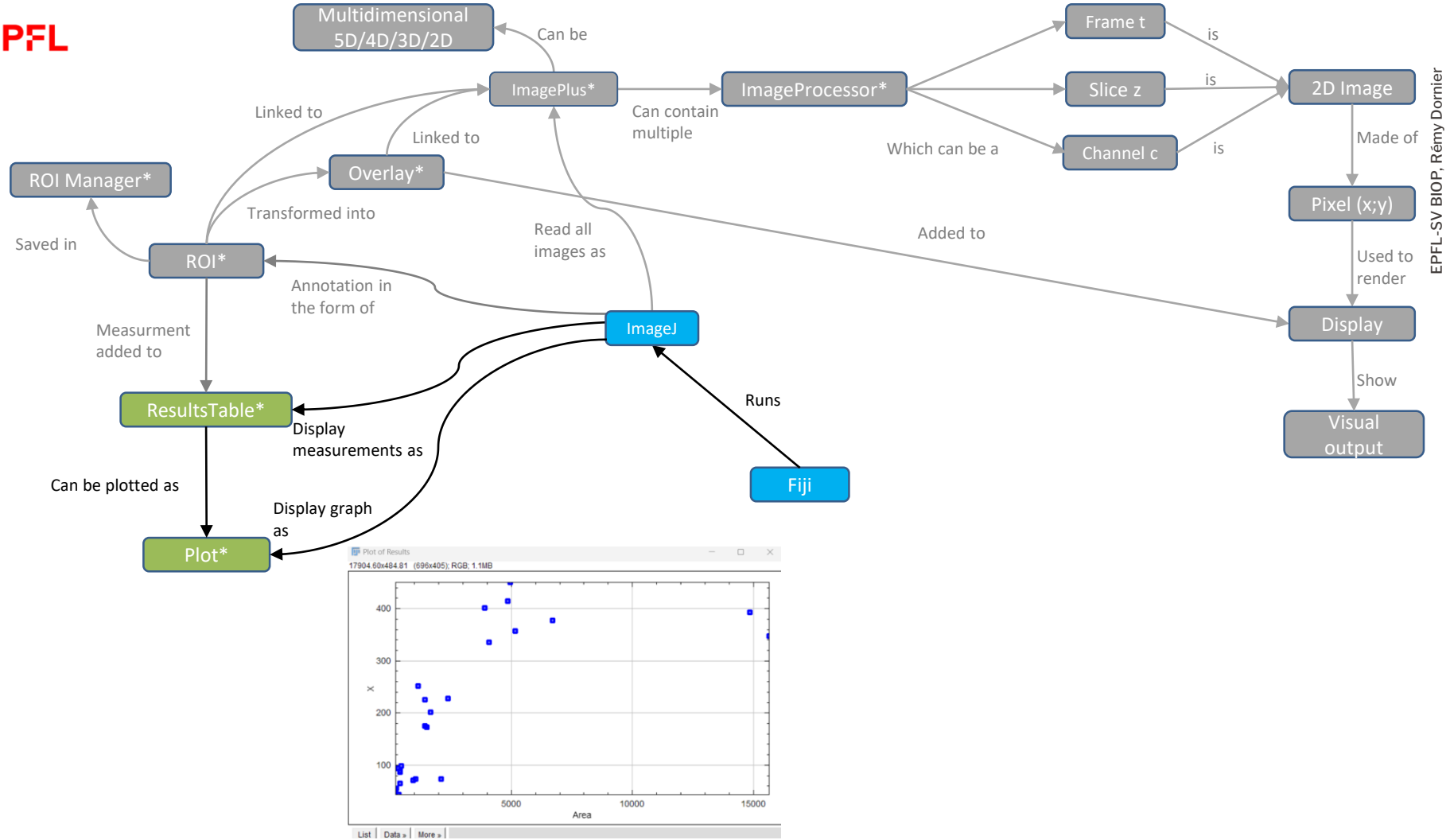




Results

File Edit Font Results

	Label	Area	X	Y
1	Composite.ome.tiff - Composite.ome.tiff #4:0001-0134-0175:c:1/4 - Composite.ome.tiff #4	1428	175	134
2	Composite.ome.tiff - Composite.ome.tiff #4:0001-0162-0252:c:1/4 - Composite.ome.tiff #4	1148	252	162.500
3	Composite.ome.tiff - Composite.ome.tiff #4:0001-0236-0225:c:1/4 - Composite.ome.tiff #4	1435	225.500	236.500
4	Composite.ome.tiff - Composite.ome.tiff #4:0001-0248-0357:c:1/4 - Composite.ome.tiff #4	5162	357.000	248.500
5	Composite.ome.tiff - Composite.ome.tiff #4:0001-0375-0335:c:1/4 - Composite.ome.tiff #4	4067	335.500	375.500
6	Composite.ome.tiff - Composite.ome.tiff #4:0001-0393-0173:c:1/4 - Composite.ome.tiff #4	1512	173.000	393.000
7	Composite.ome.tiff - Composite.ome.tiff #4:0001-0341-0089:c:1/4 - Composite.ome.tiff #4	396	89.500	341.000
8	Composite.ome.tiff - Composite.ome.tiff #4:0001-0126-0073:c:1/4 - Composite.ome.tiff #4	1032	73.000	126.500

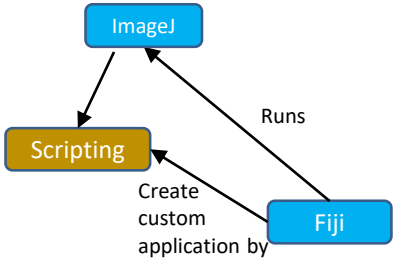


EPFL-SV BIOP, Rémy Dornier

Scripting in Fiji

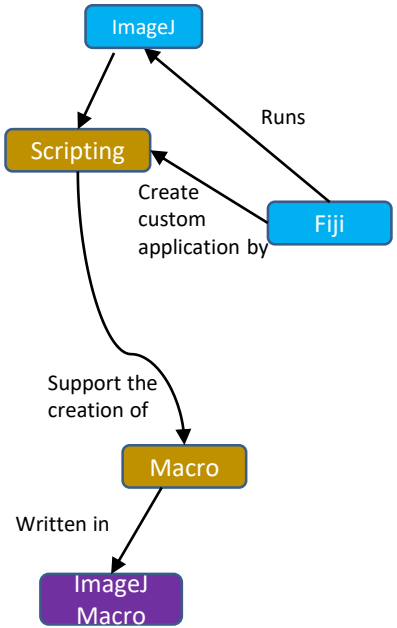
Script

- programmatic way to do things automatically



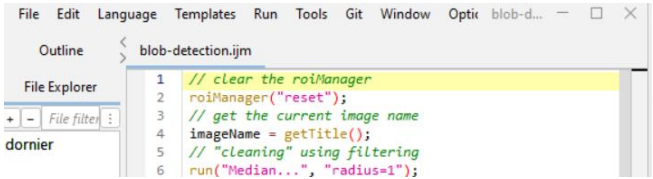
Script

- programmatic way to do things automatically
  - Using macros -> simple code to automate daily routines

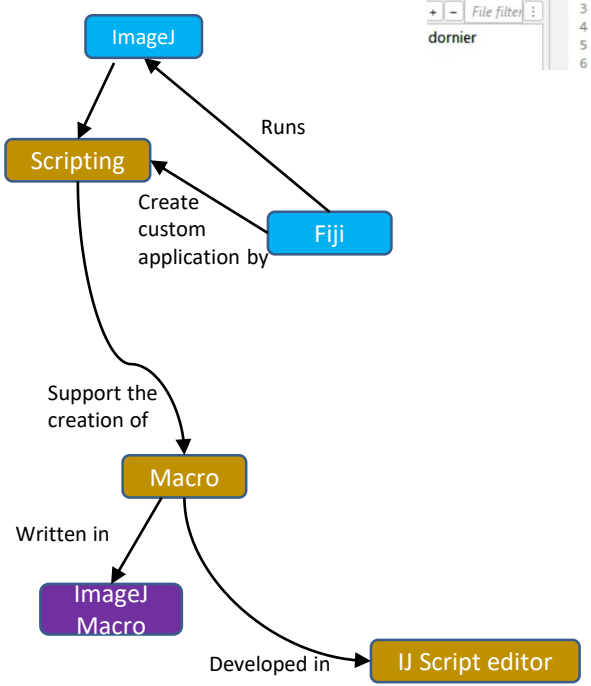


Script

- programmatic way to do things automatically
  - Using macros -> simple code to automate daily routines

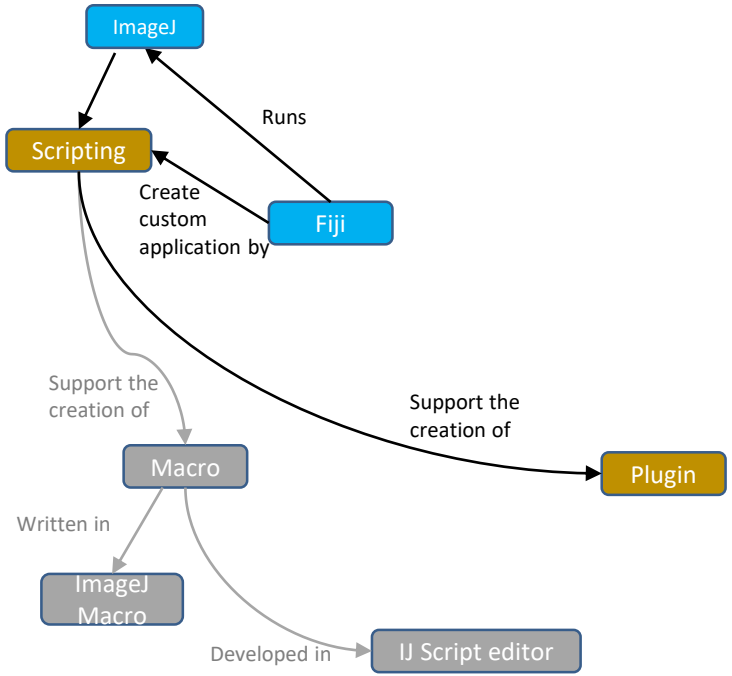


Script editor



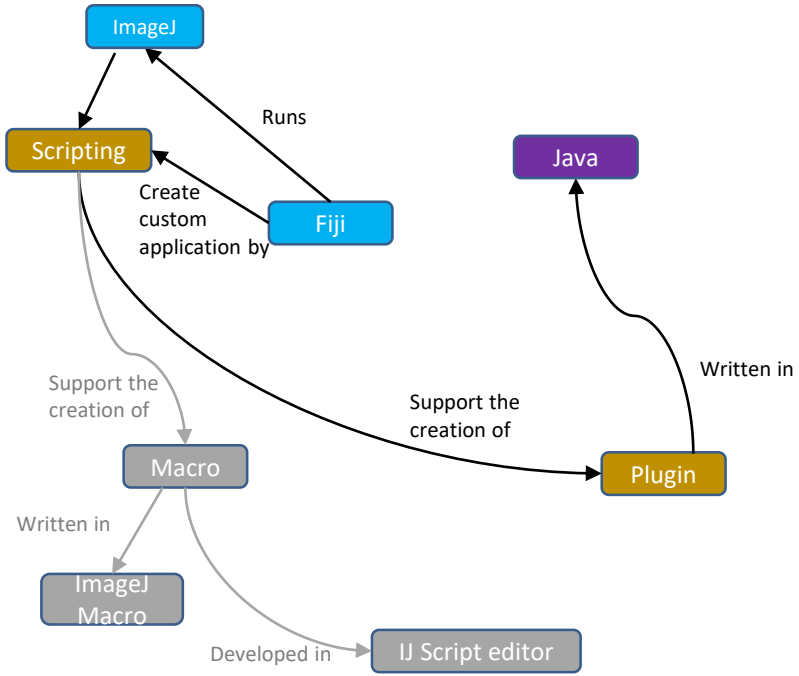
Script

- programmatic way to do things automatically
  - Using macros-> simple code to automate daily routines
  - Using plugins -> much heavier code for more complex problems



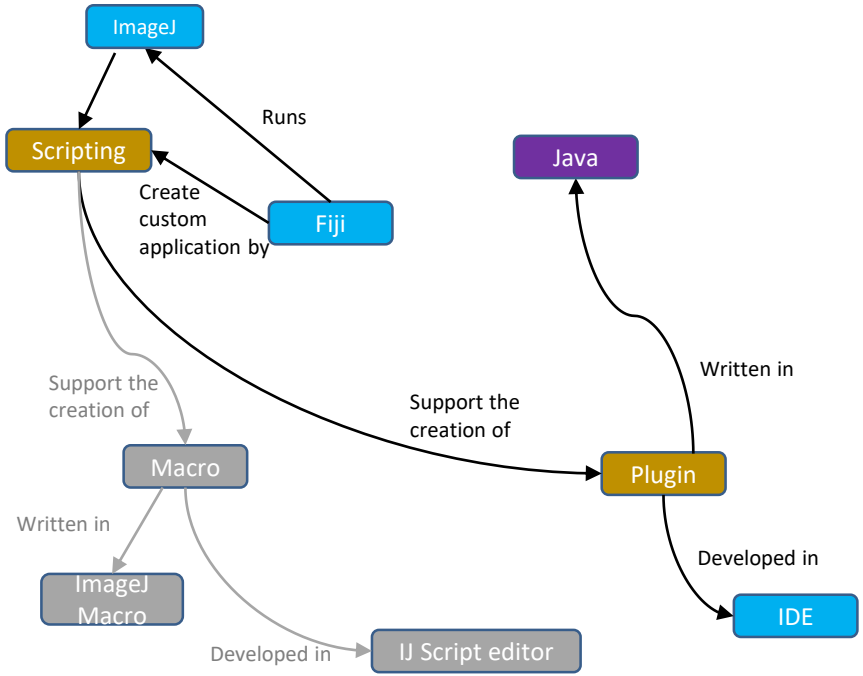
Script

- programmatic way to do things automatically
  - Using macros-> simple code to automate daily routines
  - Using plugins -> much heavier code for more complex problems



Script

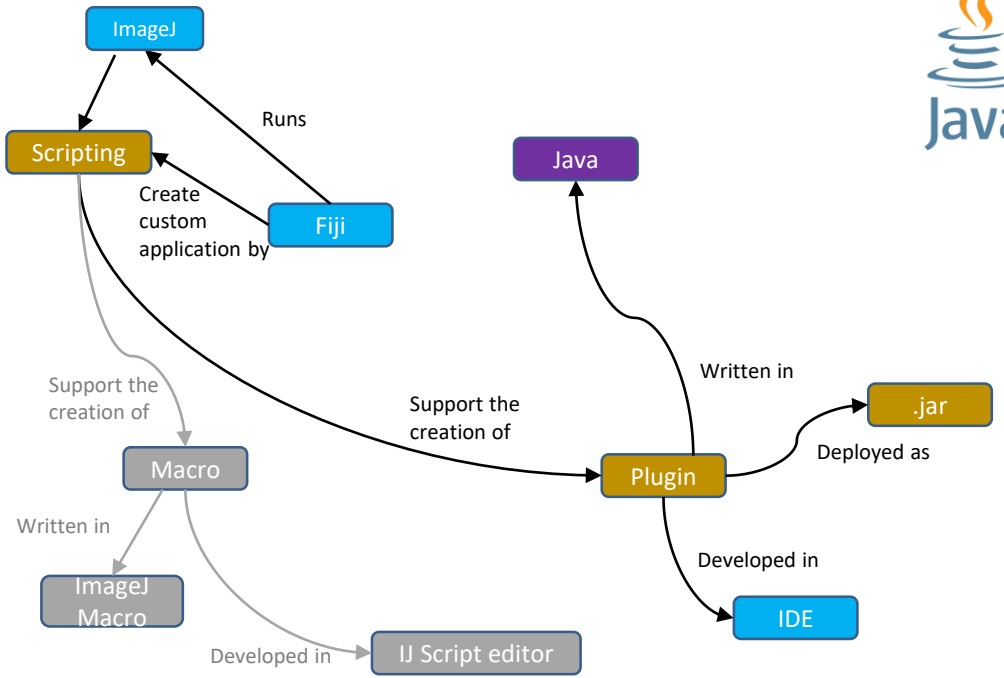
- programmatic way to do things automatically
  - Using macros-> simple code to automate daily routines
  - Using plugins -> much heavier code for more complex problems



EPFL-SV BIOP, Rémy Dornier

Script

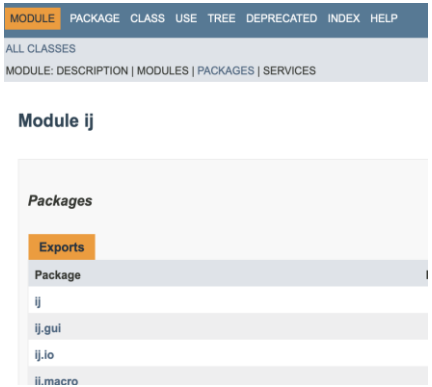
- programmatic way to do things automatically
  - Using macros-> simple code to automate daily routines
  - Using plugins -> much heavier code for more complex problems

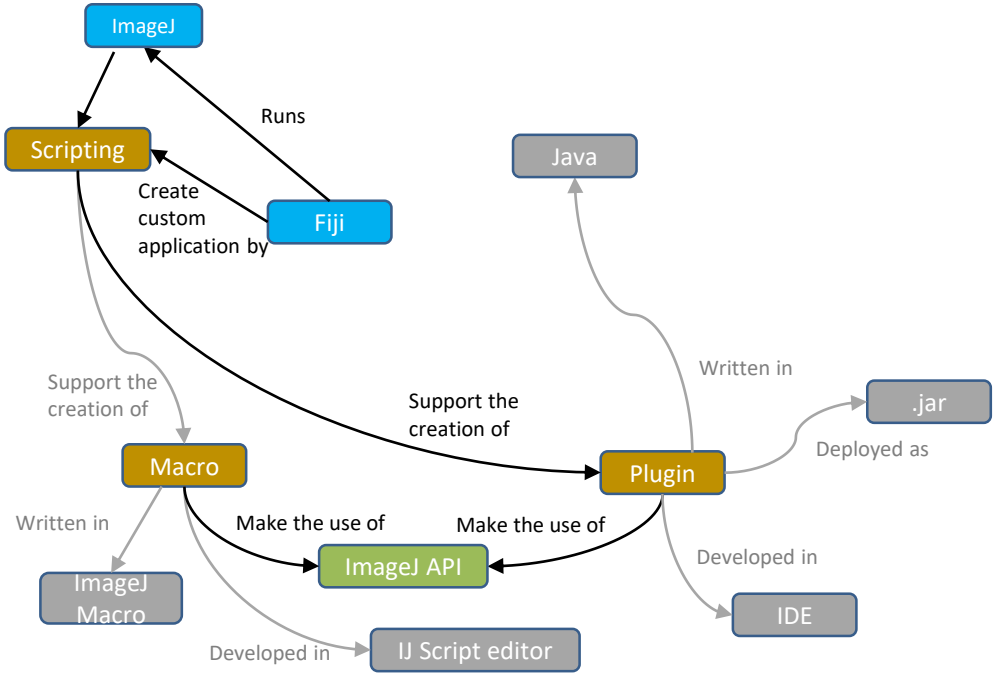


- ROI Manager*
- ROI*
- ResultsTable*
- Plot*
- Overlay*
- ImagePlus*
- ImageProcessor*
- ...

Fiji API

- Application programming interface = methods and objects to communicate with the software AND a programming language
- Java https://imagej.net/ij/developer/api/ij/module-summary.html
- Macro : https://imagej.net/ij/developer/macro/functions.html





Fiji API

- ROI Manager*
- ROI*
- ResultsTable*
- Plot*
- Overlay*
- ImagePlus*
- ImageProcessor*
- ...

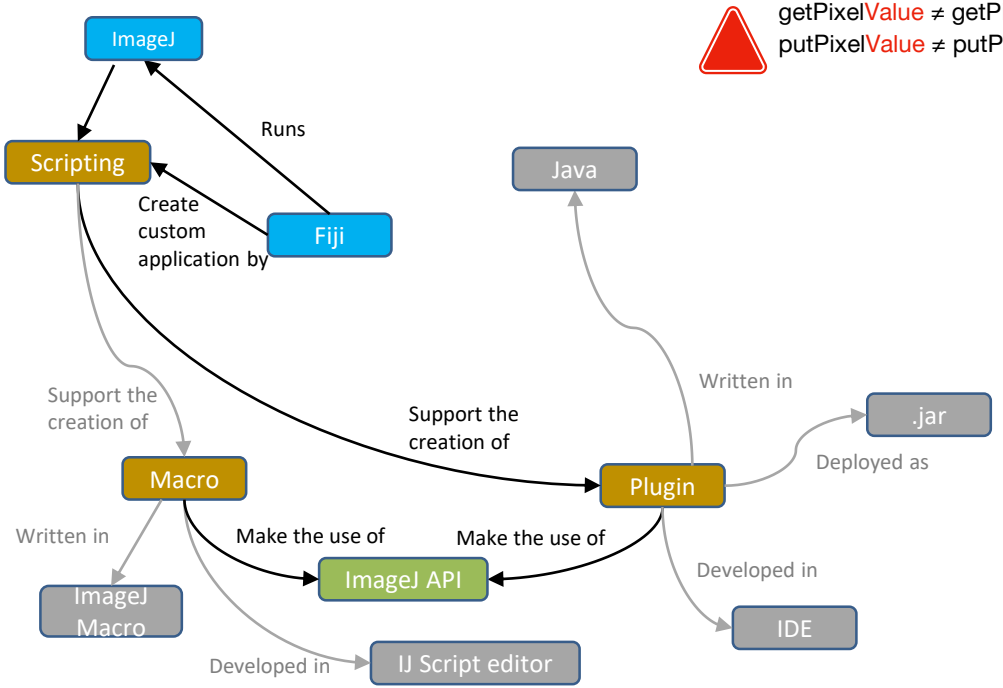
Class ImagePlus

```
ImagePlus imp = IJ.getImage();
imp.show();
```

Class ImageProcessor (2D data pixels)

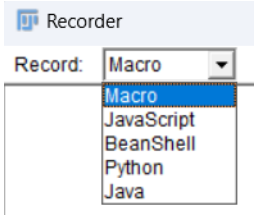
```
imp.setPosition(c, z, t);
ImageProcessor ip = imp.getProcessor();
double d = ip.getPixelValue(10, 2);
ip.putPixelValue(10, 2, d*2);
```

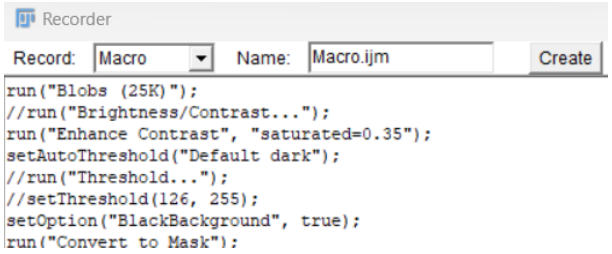
getPixelValue ≠ getPixel
putPixelValue ≠ putPixel

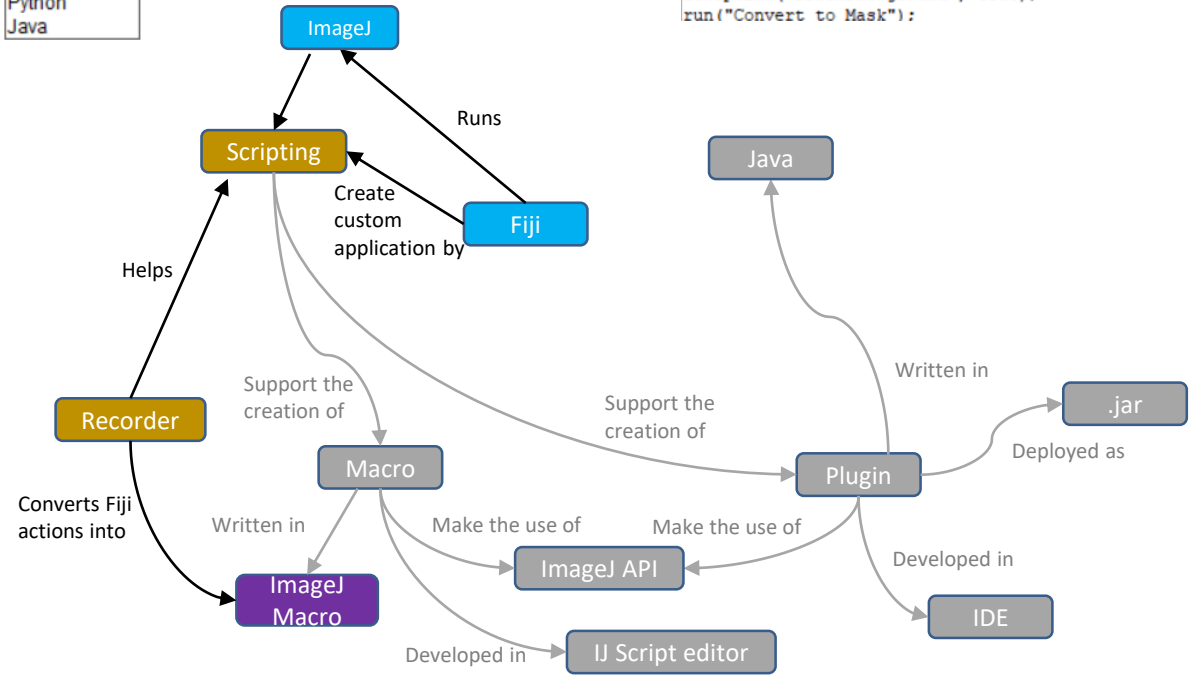


Fiji API – Helping you programming

- Macro recorder

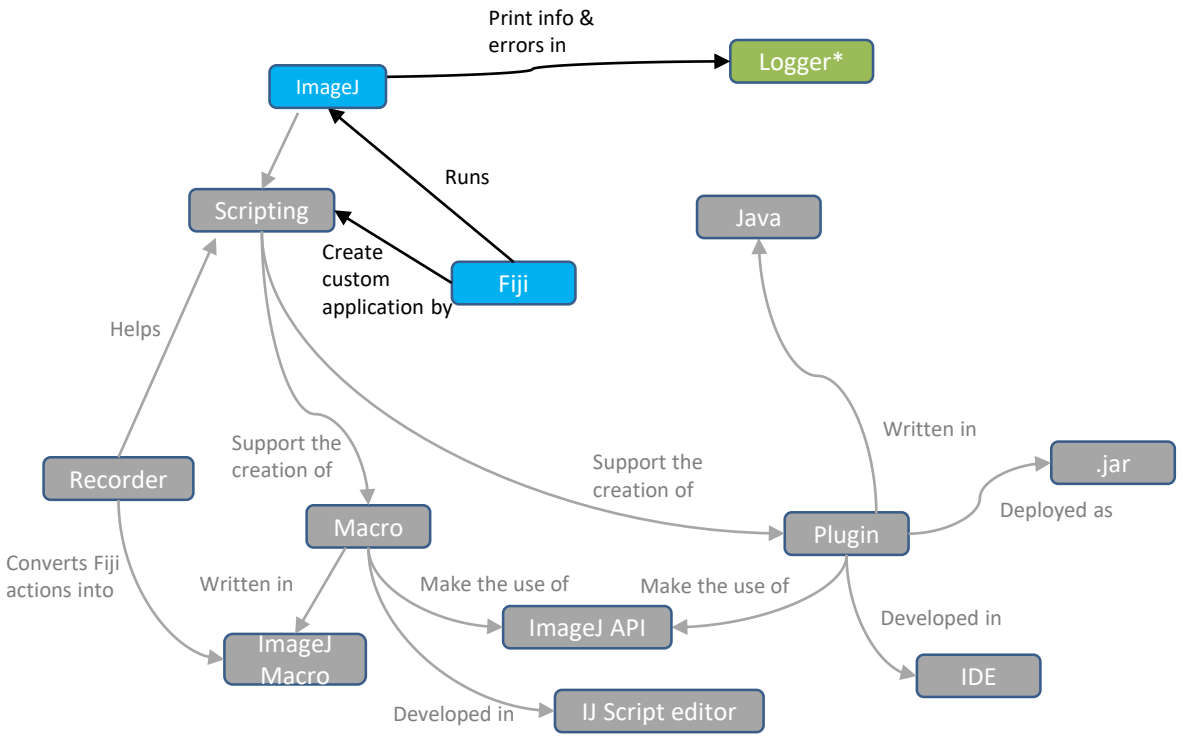






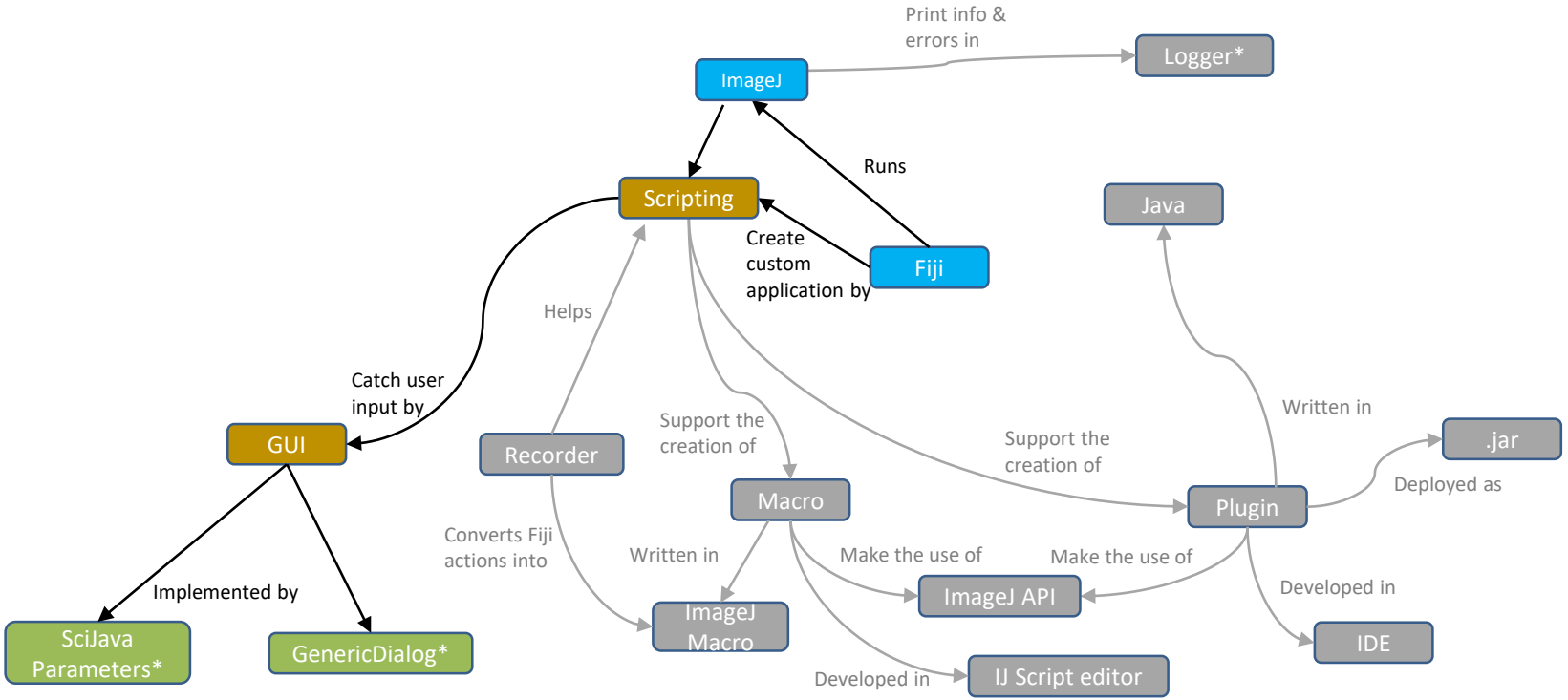
Fiji API – Helping you programming

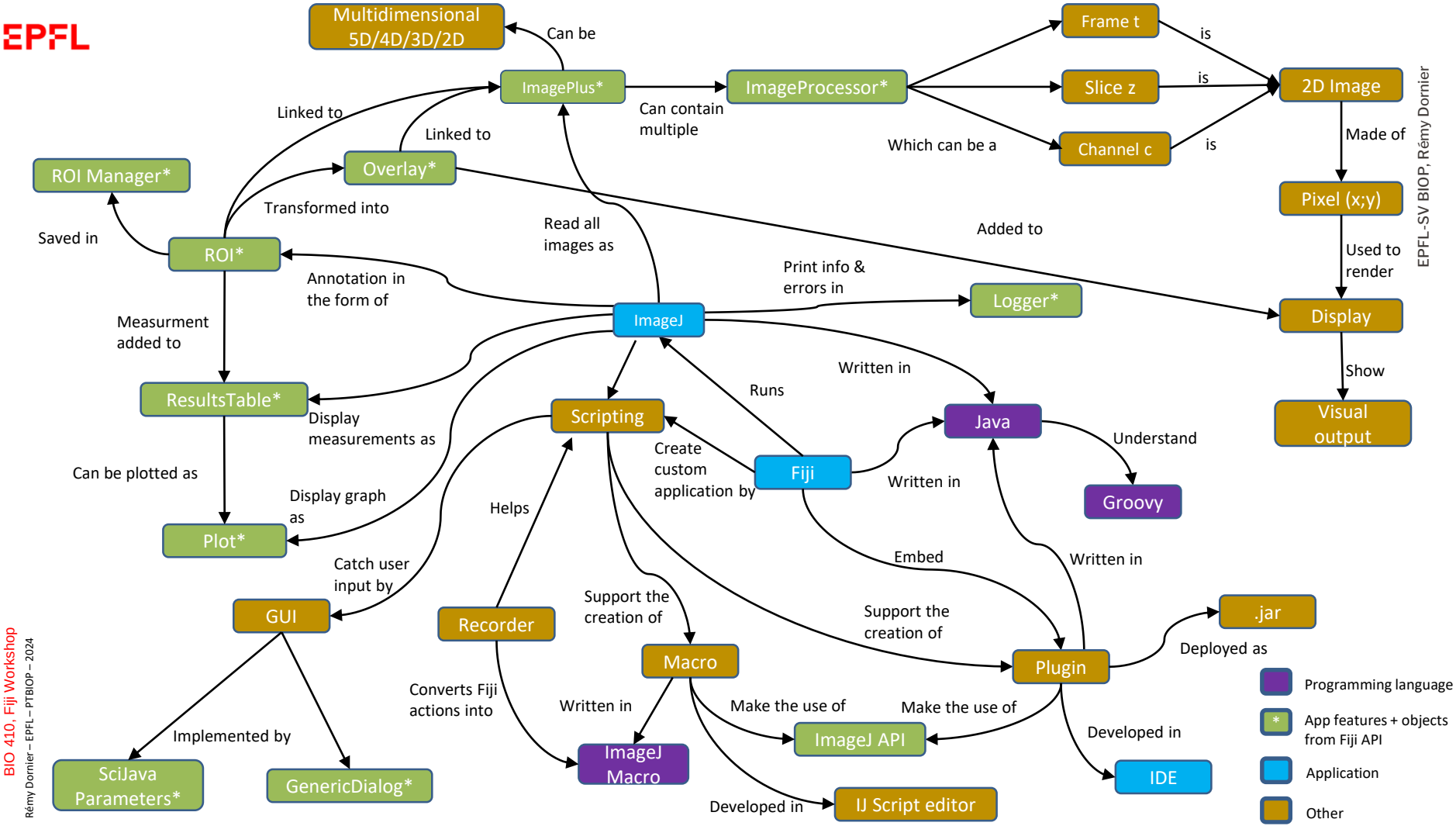
- Macro recorder
- Logger, to print outputs and help debugging



Fiji API – Catch user inputs

- Use GUI (Graphical User Interface)
- 2 implementations




Multidimensional 5D/4D/3D/2D
Can be
ImagePlus*
ImageProcessor*
Can contain multiple
Frame t
Slice z
Channel c
Which can be a
is
is
is
2D Image
Made of
Pixel (x;y)
Used to render
Display
Show
Visual output
Linked to
Linked to
ROI Manager*
Overlay*
Transformed into
Saved in
ROI*
Read all images as
Added to
Annotation in the form of
Print info & errors in
Logger*
ImageJ
Measurment added to
ResultsTable*
Display measurements as
Can be plotted as
Plot*
Display graph as
Scripting
Runs
Written in
Java
Understand
Groovy
Create custom application by
Fiji
Written in
Helps
Catch user input by
GUI
Recorder
Support the creation of
Macro
Support the creation of
Plugin
Embed
Written in
.jar
Deployed as
Converts Fiji actions into
Written in
ImageJ Macro
Make the use of
ImageJ API
Make the use of
Developed in
IDE
Developed in
IJ Script editor
Implemented by
SciJava Parameters*
GenericDialog*
Programming language
App features + objects from Fiji API
Application
Other
EPFL-SV BIOP, Rémy Dornier
BIO 410, Fiji Workshop
Rémy Dornier – EPFL – PTBIOP – 2024