



Tools introduction and installation

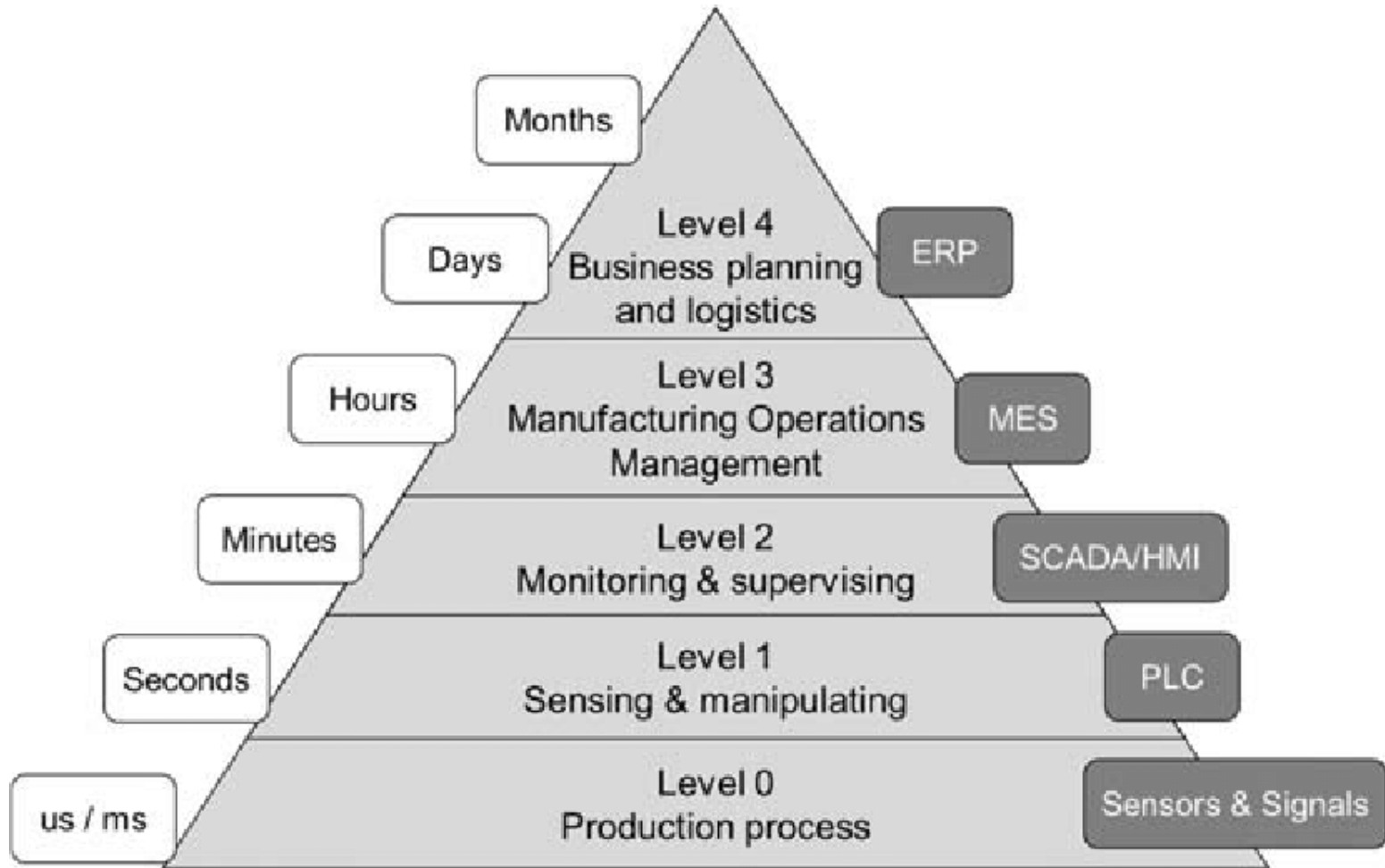
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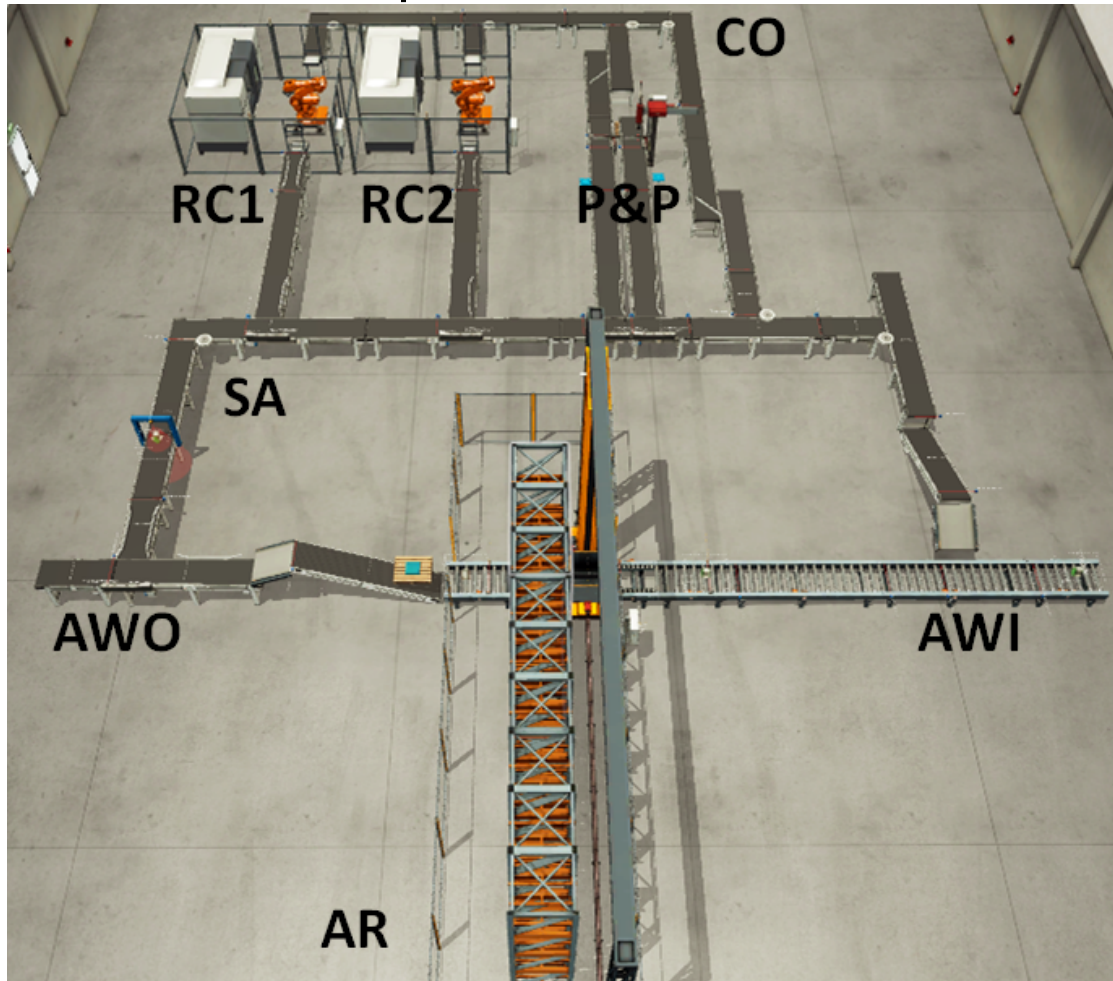
Motivation

The automation pyramid according to the ISA 95 model:



Motivation

A little the shop floor...



- RC1, RC2, P&P
- AWI, SA, CO, AWO
- AR

Motivation

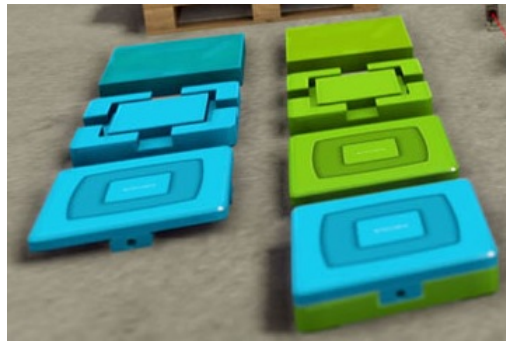
Transformation Cells:

RC1 production of "bases" from "raw" materials;

RC2 production of "lids" from "raw" materials;

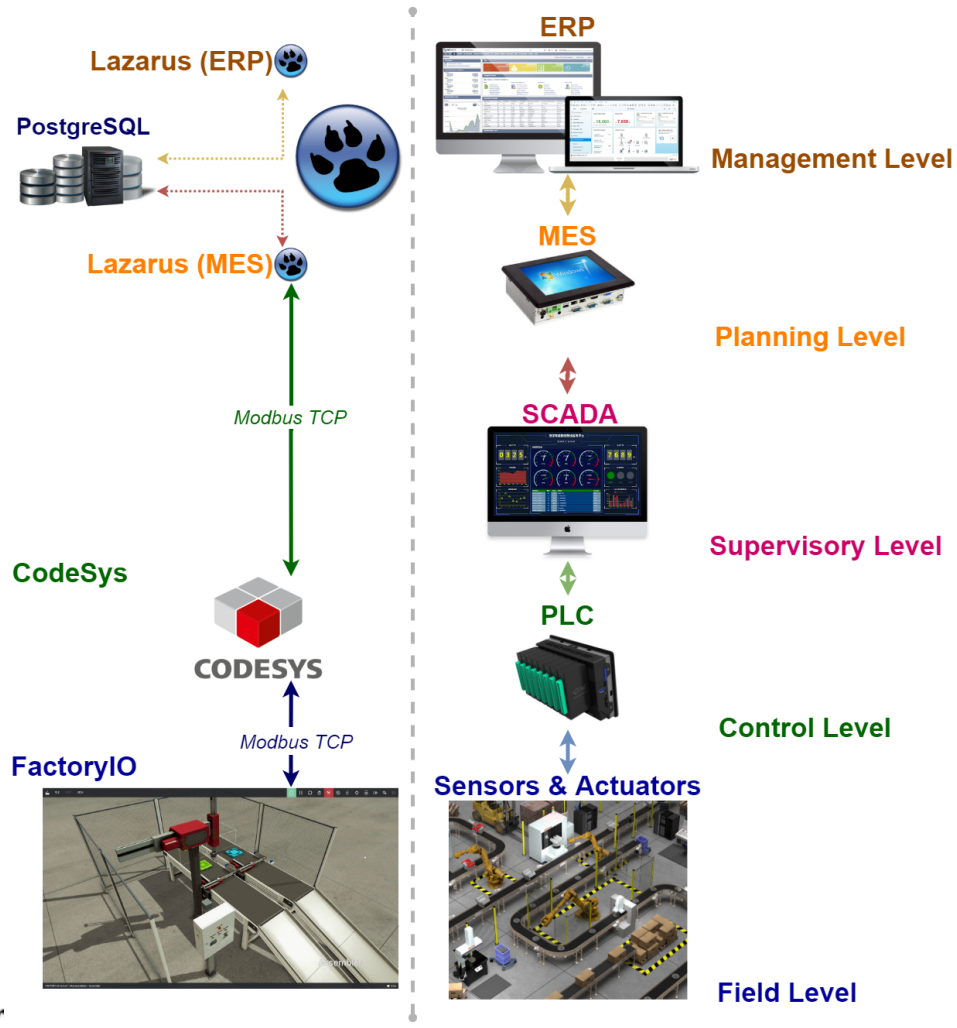
P&P generation of complex parts by aggregating a "base" plus a "lid" product;

Products can have different colors (e.g., green, blue and gray) that represent distinct part's material.



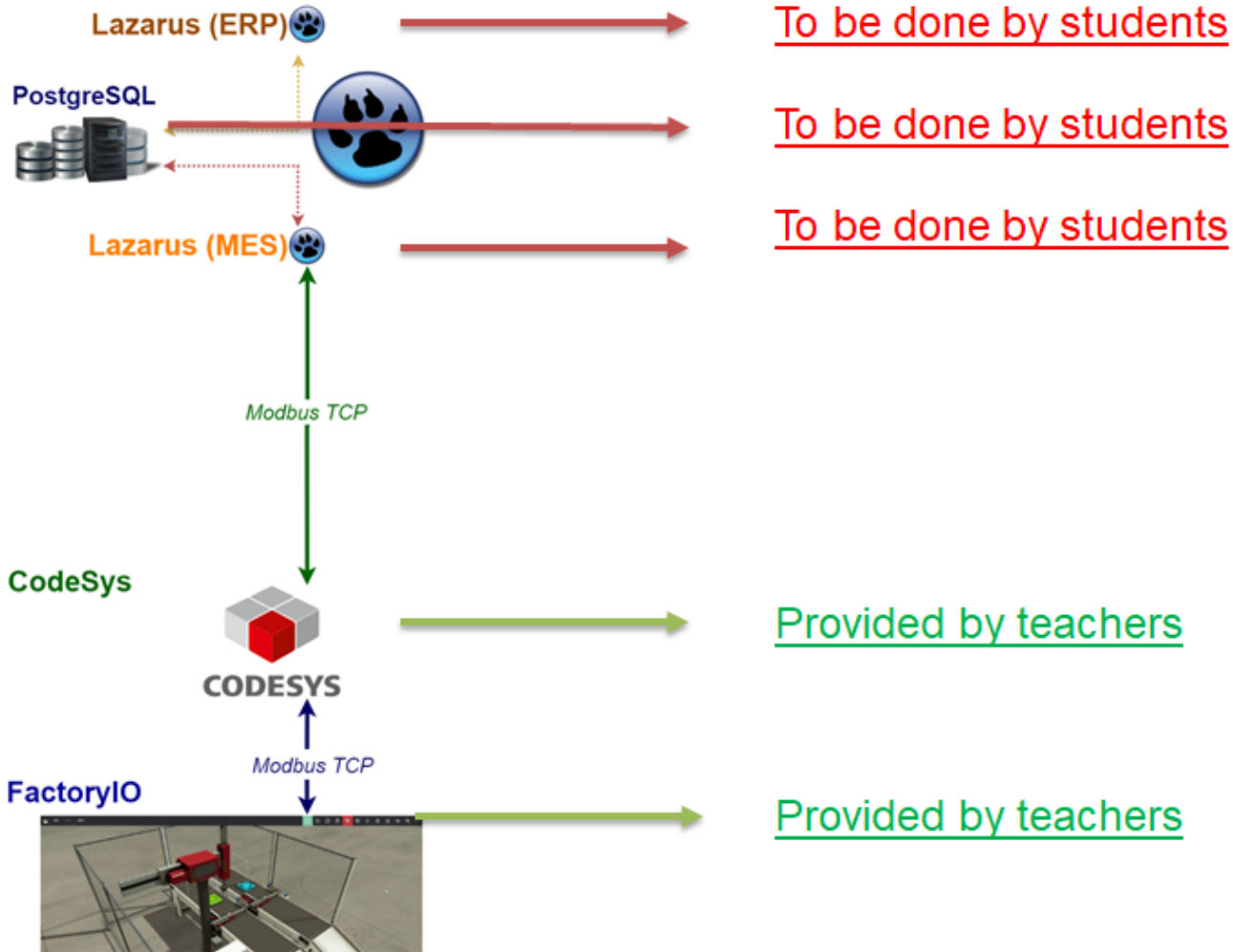
Motivation

Tools that will be approached at INFI.



Motivation

The project will include:



Me

Lazarus IDE

Lazarus IDE

Lazarus IDE

Lazarus strives for write once compile anywhere.

Lazarus is a free and open source development tool.

A cross-platform IDE for **Free Pascal** programming language.

What it means?

- Runs on Linux, macOS and Windows.
- Uses the **Free Pascal Compiler**.
- The GUI is being developed to be totally and completely API independent.
- The code for Free Pascal Compiler (FPC) is licensed under the GPL

Getting Started

Helpful links:

Lazarus IDE <https://www.lazarus-ide.org>

Free Pascal Wiki <https://wiki.freepascal.org>

Free Pascal Instalation Guide <https://www.freepascal.org/docs-html/user/usersu3.html>

Free Pascal Language Reference Manual <ftp://ftp.freepascal.org/pub/fpc/docs-pdf/ref.pdf>

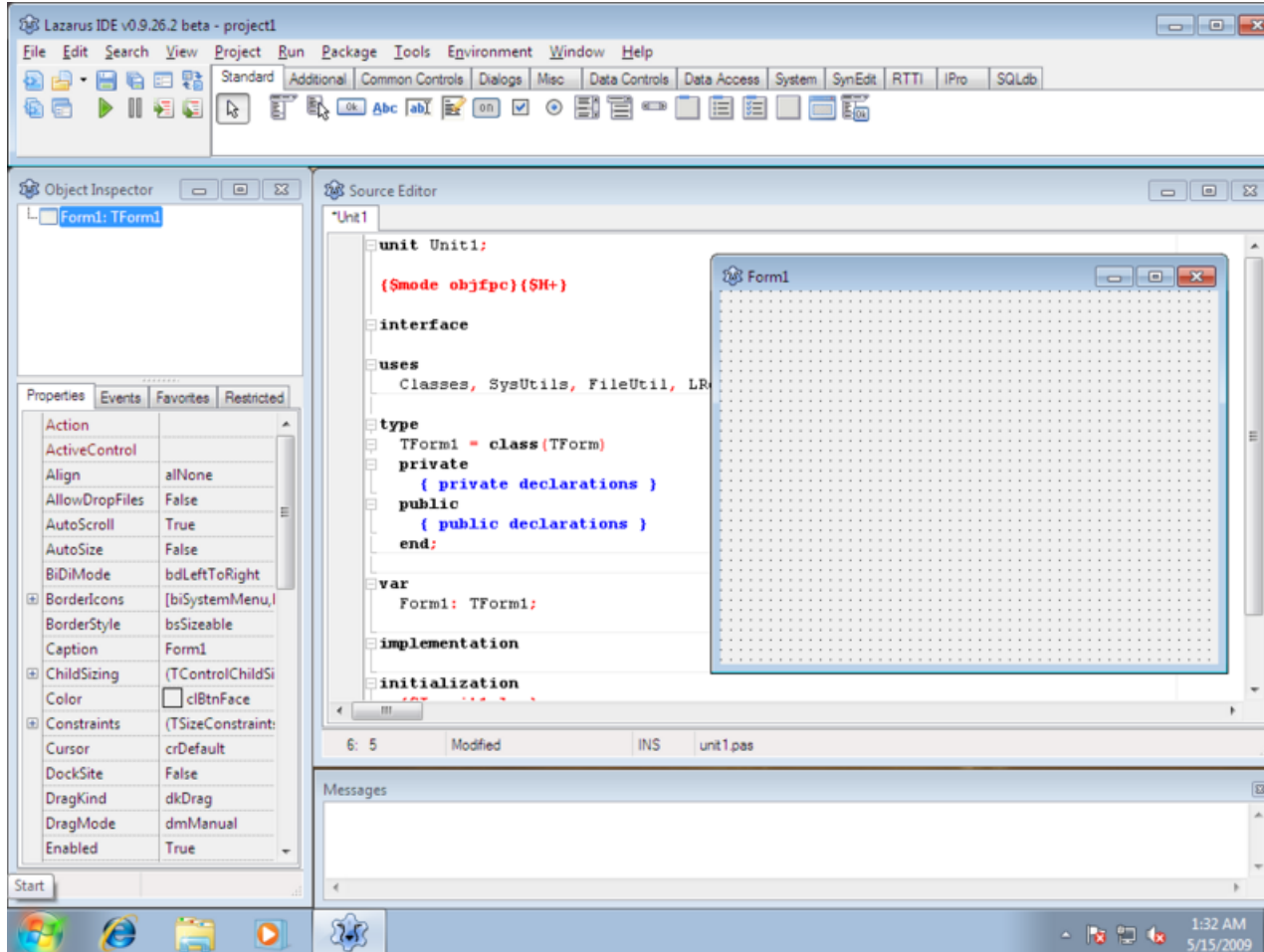
A video for installing Lazarus & FPC on:

Windows <https://youtu.be/M1JORg41NIY>

macOS https://youtu.be/QE_IAjkXE1g

Getting Started

Select "File-New" and then "Project/Application".



Open the File menu and click Save All.

Getting Started

The Lazarus files:

- `.lpr` is the project file;
- `.pas` is the unit that contains the code for the form, and is usually the file that the application programmer needs to edit or inspect.

There are many more files:

- `.exe` is main program binary executable (Windows OS);
- `.lpi` is the main information file of a Lazarus project (a XML format);
- `.lpr` is the main program source file or master file;
- `.lfm` is a human readable form to store the layout of the form unit;
- `.ppu` is the compiled unit (linked into the executable file together with any other units named in the Uses section).

Getting Started

The GUI of Lazarus is formed by several windows will appear on the desktop:

Editor Windows/Component Palette on the top;

Object Inspector on the left;

Source Editor on the center;

Form Editor on the right;

Messages on the bottom.

The "Unit1" is the name of the unit that goes with Form1.

The file Unit1.pas contains the source code for Form1, the main form of your application.

Getting Started

Keyboard shortcuts:

- **Ctrl+F9** will compile the program;
- **F9** will run the program;
- **F12** will change between the "Source Editor" and the "Form Editor".
- **Ctrl + Space** will make an auto-completion;
- **Ctrl + Alt + UP** jumps between a procedure body (begin..end) and the procedure definition (procedure Name).

Getting Started

Let's install and run the Lazarus IDE ...

Codesys

Codesys

Getting Started

A tool for programming PLC (that has a softPLC). It is compliant to IEC 1131-3 in the programming languages:

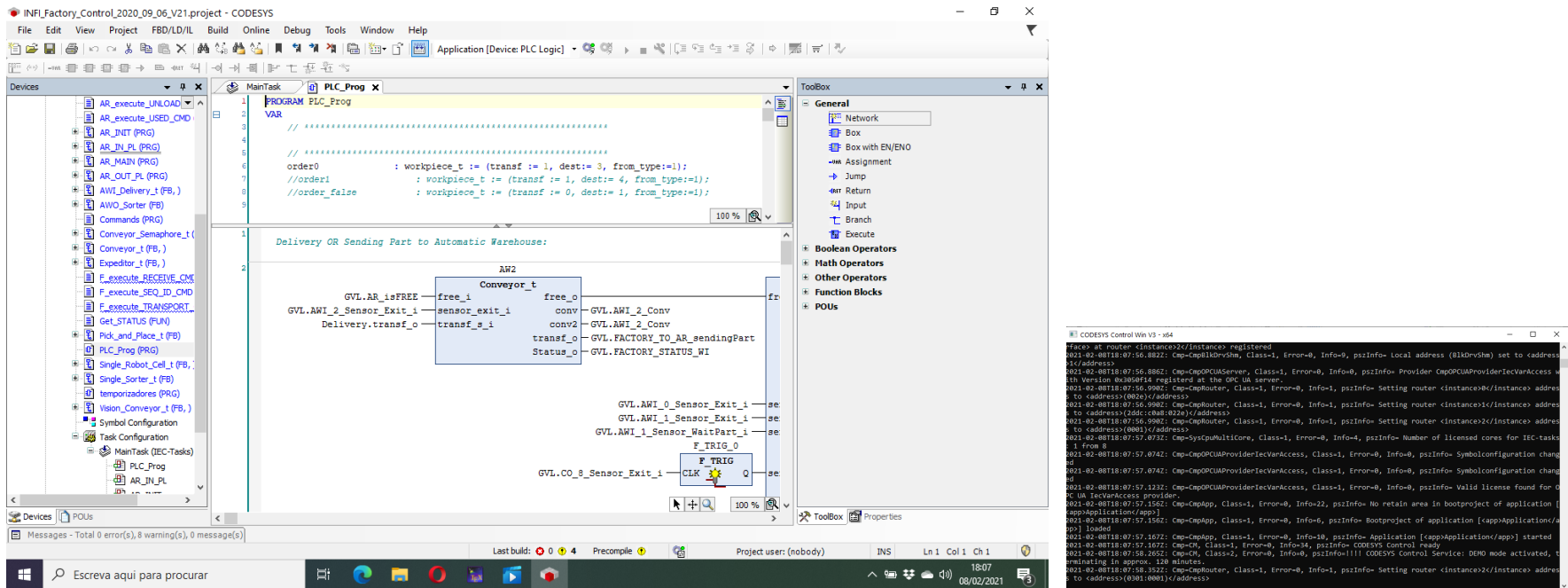
- Instruction List (IL)
- Ladder diagram (LD)
- Function block diagram (FBD)
- Sequential function chart (SFC)
- Structured text (ST)

<https://www.codesys.com>

Getting Started

Codesys includes:

- a GUI for programming and upload programs to devices, e.g., sofPLC.
- a runtime (softPLC) that executes programs.



Getting Started

Let's install and run the Codesys ...

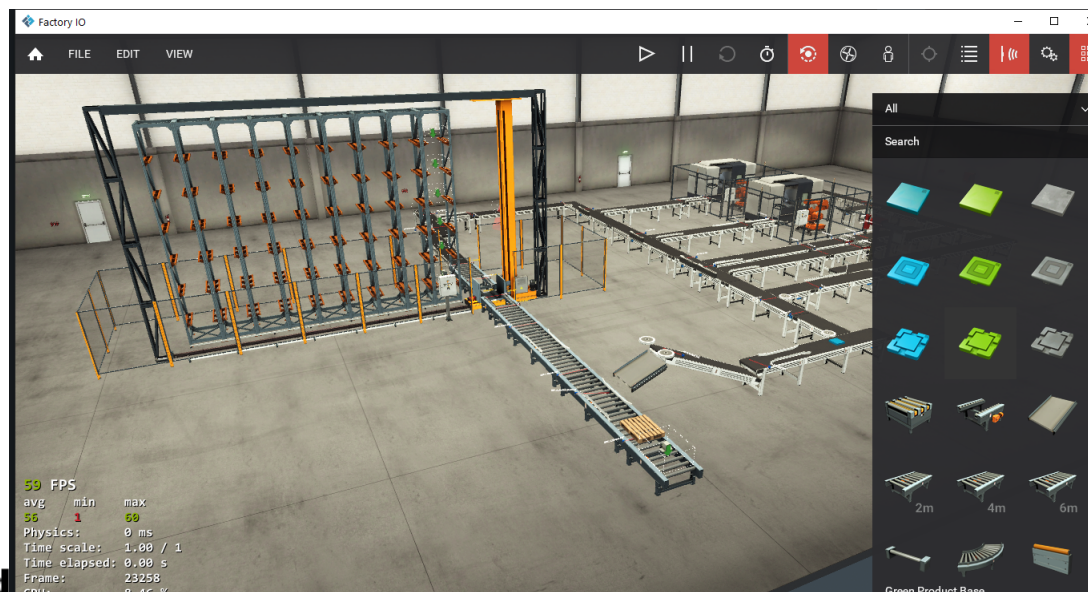
Factory IO

Factory IO

Getting Started

Factory I/O is a 3D factory simulation:

- to validate control programs for PLCs.
- to communicate with several controllers (using drivers).
- to create a virtual factory using a selection of common industrial parts.
- to be used with microcontrollers, SoftPLC, Modbus, among many other technologies.



Getting Started

Let's install and run the FIO ...

`https://docs.factoryio.com/installing/`



Questions / Dúvidas ?

Thank you!

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