

# Codesys

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Paolo Burgio

paolo.burgio@unimore.it



**UNIMORE**  
UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA

High Performance  
Real Time **Lab**



# Load the main program interface

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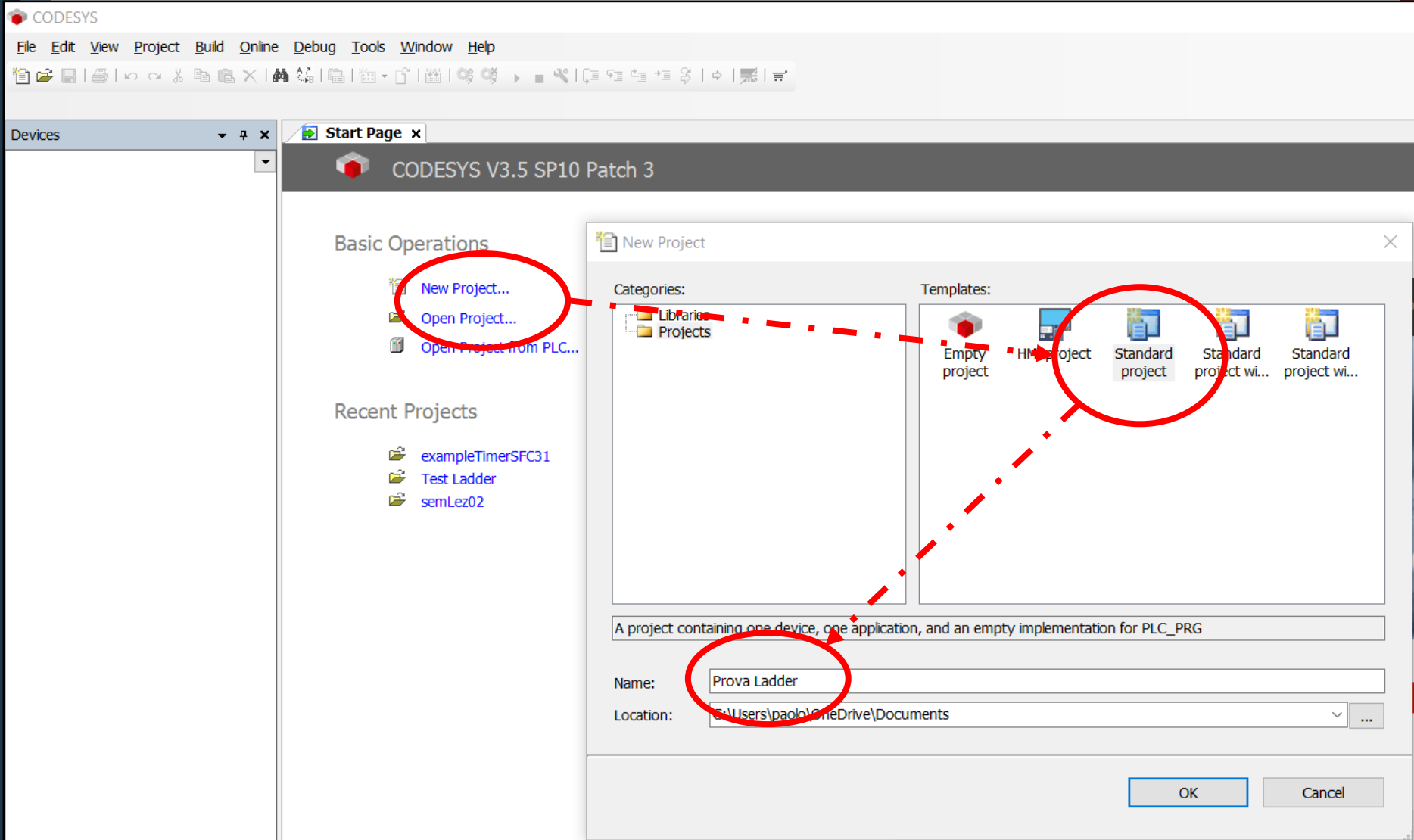
What is it?

- › An IDE to create PLC programs, and **simulate them**
- › In any of the five main languages
- › I use V3.5 SP1 patch 3, recommended version (for compatibility with the examples I'll give you)



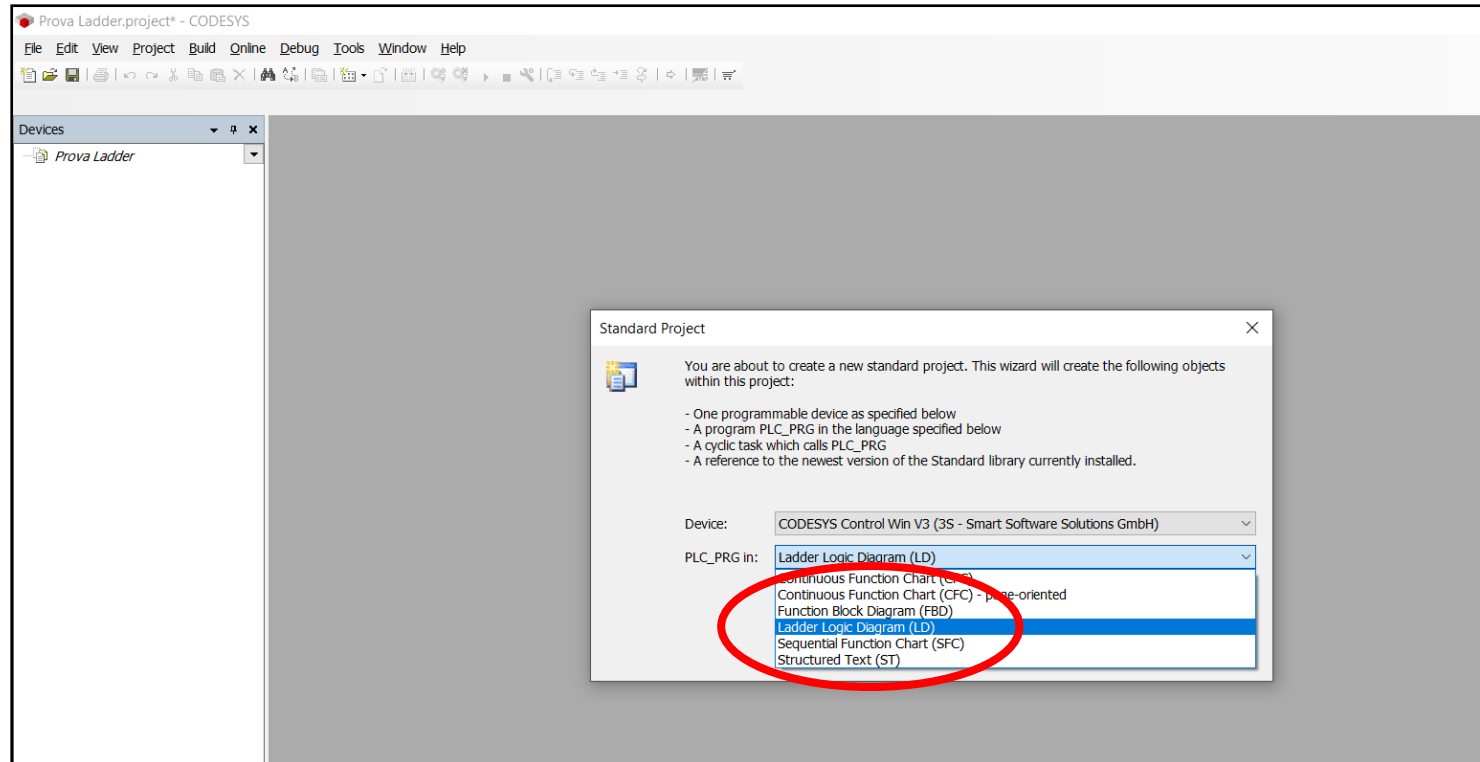


# Create a project





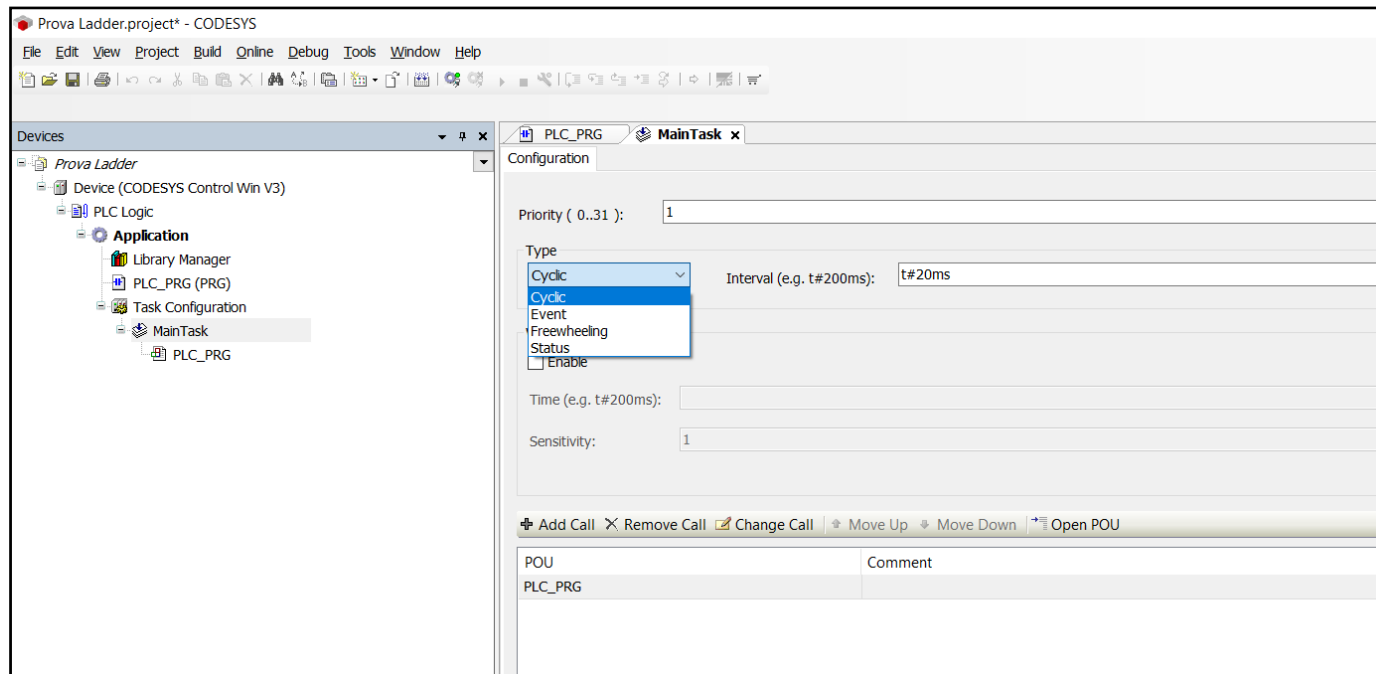
# Select the language





# Project workbench

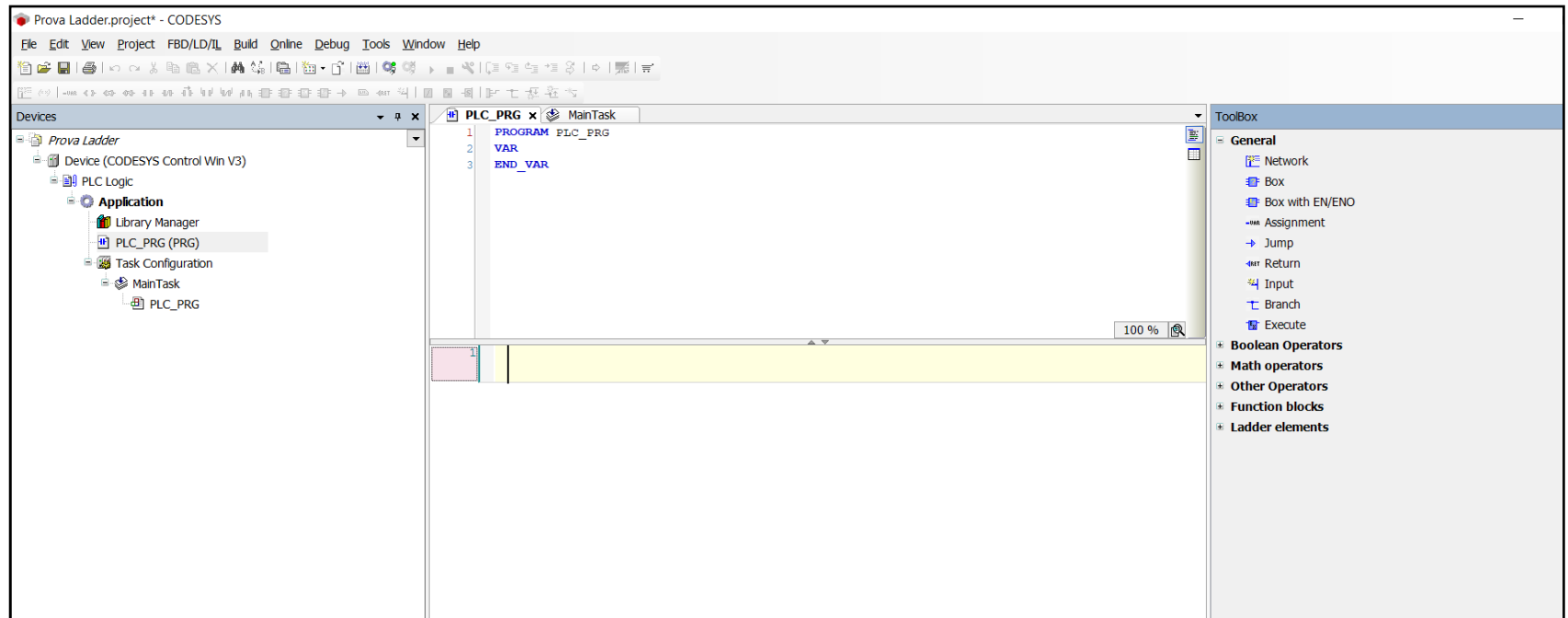
- › Your application has a Main task, that (here) runs cyclically





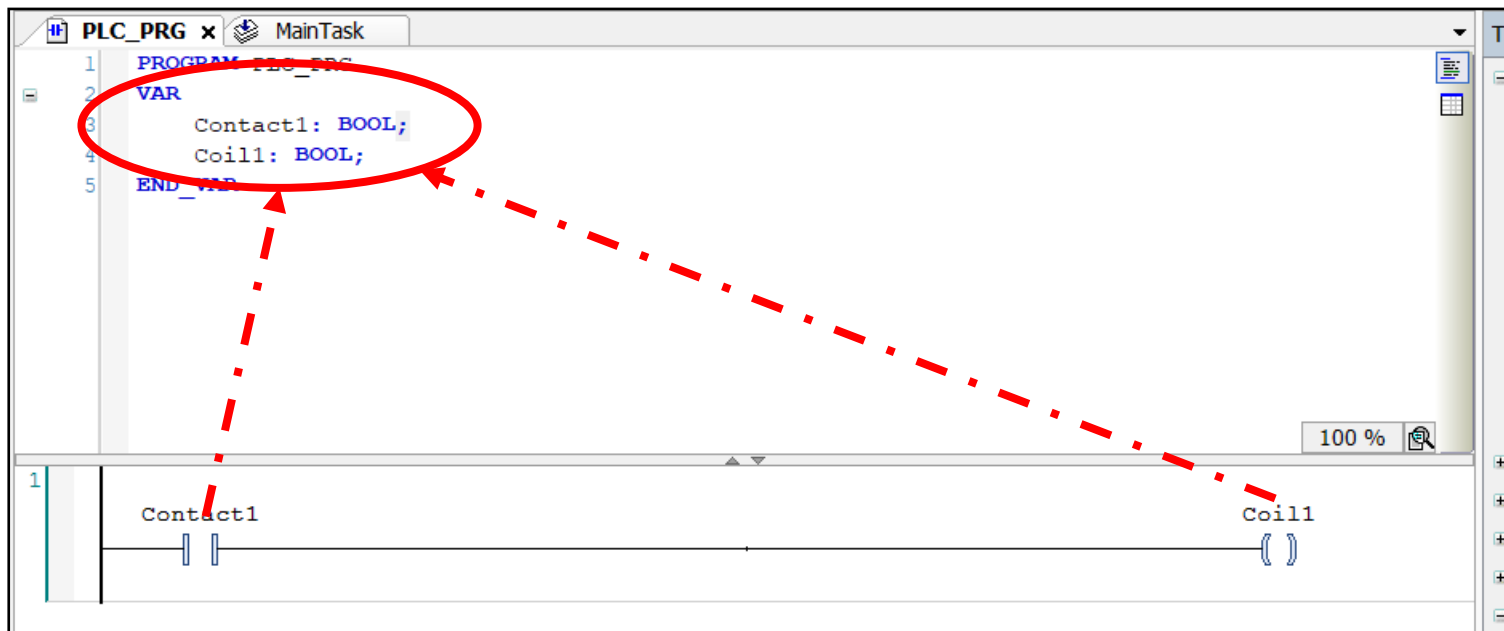
# Project workbench - Ladder

- › You can create Ladder diagrams using drag/drop from the toolbox



# Adding a contact + coil

- › Two global variables are automatically created in the variable definition window always in ST lang), both of `bool` type, as specified by us
- › Here, we want a switch that turns on a lamp, hence we need a NO contact and a coil
- › PS here you don't see the right power rail as it's implicit

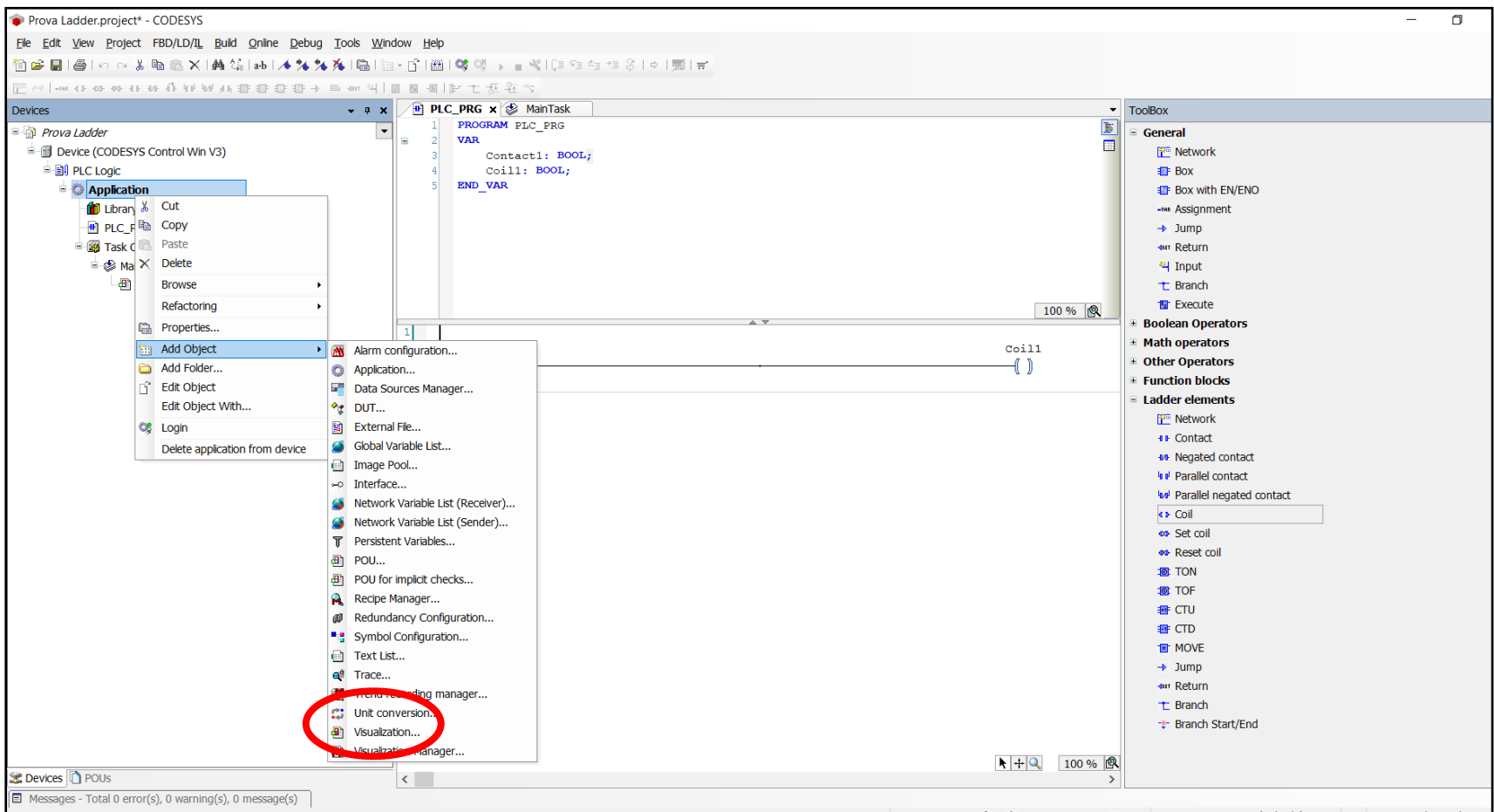




# View the simulated system

Add a Visualization object

› Application -> Add Object -> Visualization

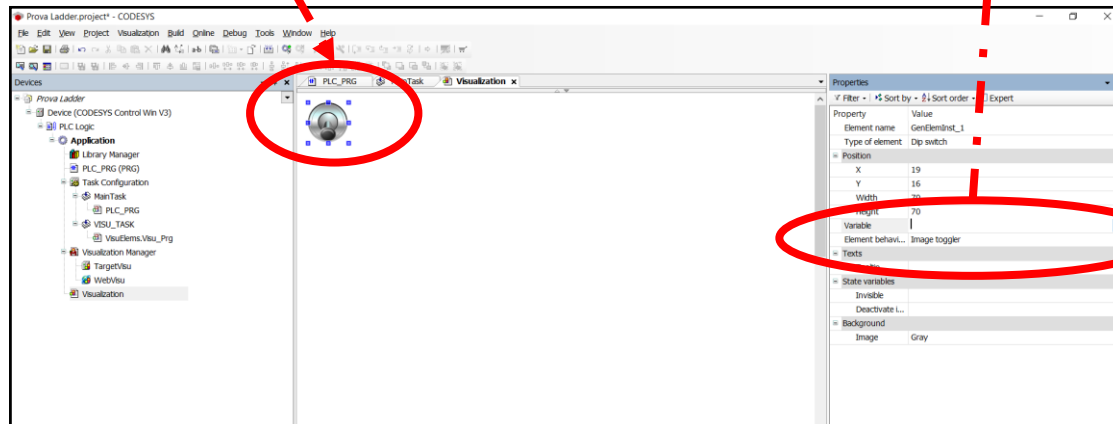
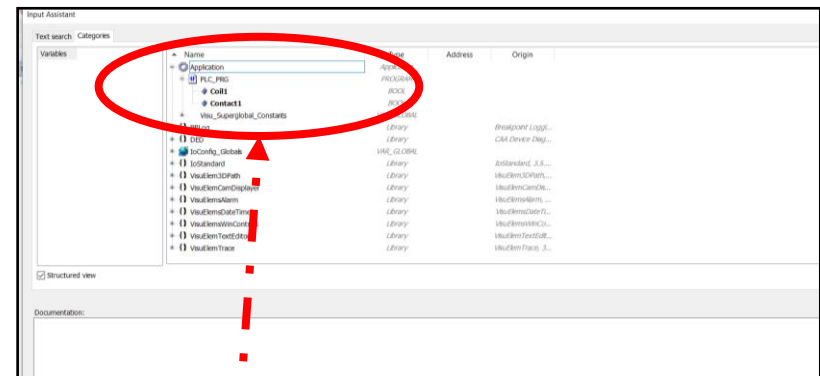
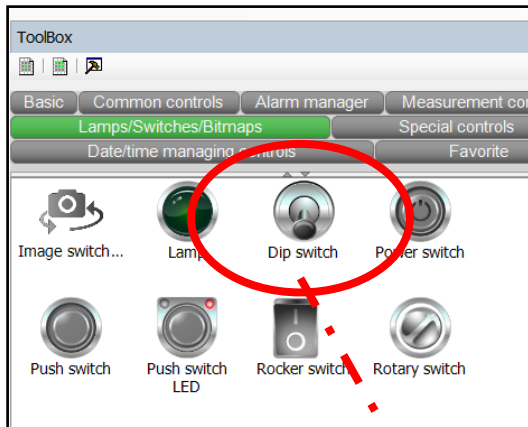






# Add elements, and link to variables

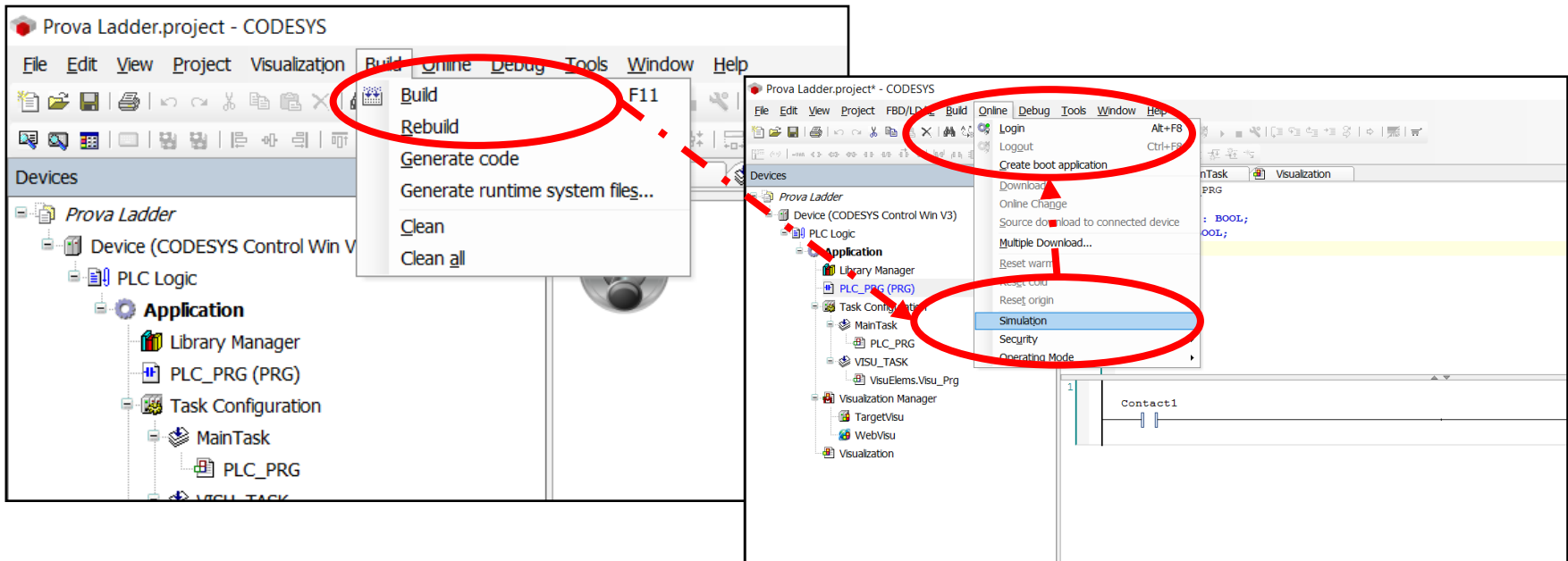
- › Here, we added a dip switch from the toolbox, and we select the `Contact1` var from the Properties window
- › Now, add a lamp and bind it to `Coil1`





# Compile and set up simulator

- › Build the system, from the menu or with F11
- › Login from the Online menu to download the required run libs
  - Before..make sure you ticked “Simulation”!
- › Now, we’re ready to go





# Run workbench

- › After a while, simulator/simulation is set up
- › Click on Debug -> Start to go
- › Nothing happens

The screenshot shows the CODESYS Run Workbench interface for a project named "Prova Ladder.project\* - CODESYS". The interface includes a menu bar (File, Edit, View, Project, Visualization, Build, Online, Debug, Tools, Window, Help) and a toolbar with various icons for file operations, simulation, and debugging.

The left sidebar displays the project tree under "Prova Ladder". The "Device [connected] (CODESYS Control Win V3)" is expanded, showing "PLC Logic" and "Application [stop]". The "Application [stop]" is further expanded, showing "Library Manager", "PLC\_PRG (PRG)", "Task Configuration", "MainTask", "PLC\_PRG", "VISU\_TASK", "VisuElems.Visu\_Prg", "Visualization Manager", "TargetVisu", "WebVisu", and "Visualization".

The main workspace shows the "PLC\_PRG" variable declaration table and a ladder logic diagram.

Expression	Type	Value	Pre
Contact1	BOOL	FALSE	
Coil1	BOOL	FALSE	

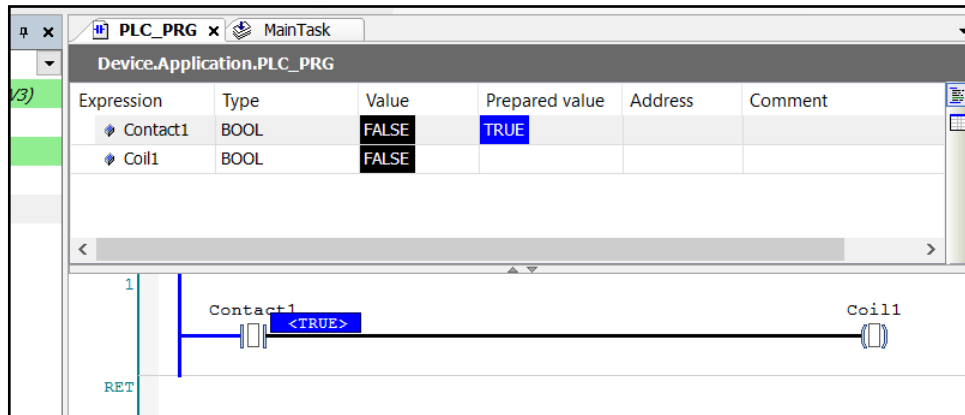
The ladder logic diagram shows a network with a "Contact1" (normally open contact) connected to a "Coil1" (coil). The network is labeled "1" and "RET".

The "Visualization" window on the right displays the message: "The online visualization is waiting for a connection. Please start the application."



# Modify values

- › Via the “watch expression” window, use the “Prepared value”
- › Then, apply the value with the Debug -> Write value menu item (or CTRL+F7)



- › In this case, in our example, we can also manually acting on the switch

Remember to log out after you're done! 😊



# Sequential contacts vs. parallel contacts

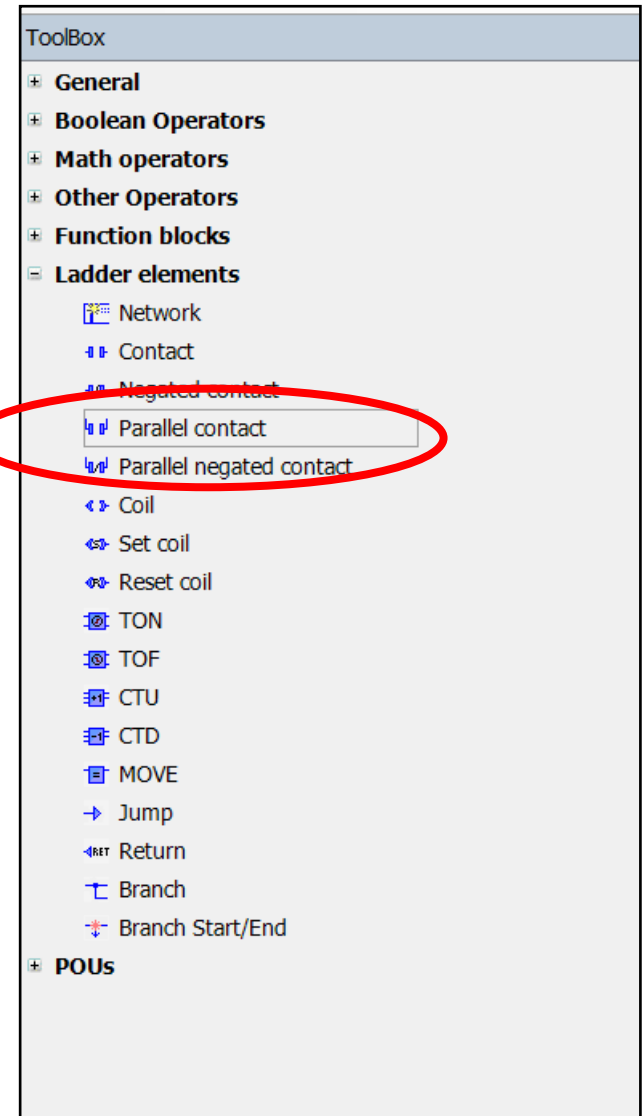
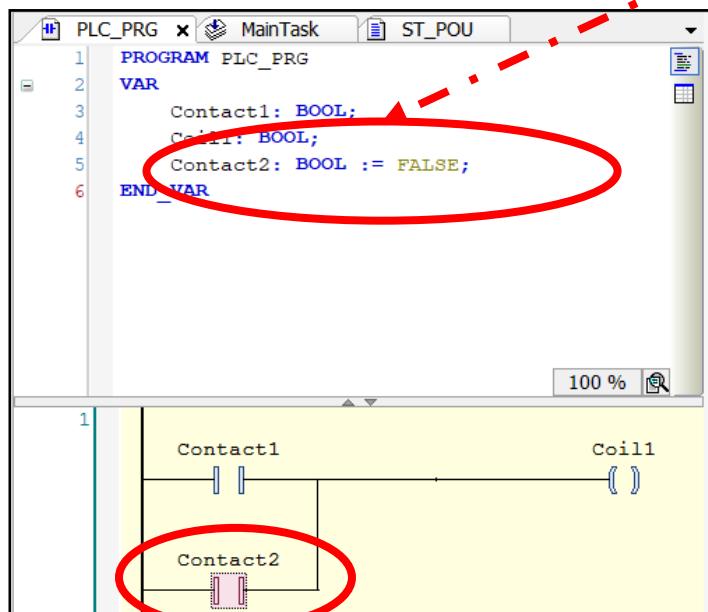
Logical “AND”


- › ..easy, simply drag&drop

Logical “OR”


- › “Parallel contact” components from toolbox
- › IDE helps us to insert it...

**PS good programmers remember to initialize vars ;)**





# Structured Text



# Add new ST POU

- › Program Organization Unit let you add logics in the same application, using different languages
- › We now add a **Program POU**

IEC 61131 does not allow spaces in names

The name must be a valid identifier according to the IEC 61131-3 standard.

Return type:

Implementation language: Structured Text (ST)

Add Cancel

Devices

Prova Ladder project - CODESYS

Device (CODESYS Control Win V3)

PLC\_PRG

ST\_POU (PRG)

PLC\_PRG

ST\_POU (PRG)

Task Configuration

MainTask

PLC\_PRG

VISU\_TASK

VisualElements\_Visu\_Prg

Visualization Manager

TargetVisu

WebVisu

Visualization



# Write the ST code

Prova Ladder.project\* - CODESYS

File Edit View Project Build Online Debug Tools Window Help

Devices

- Prova Ladder
  - Device (CODESYS Control Win V3)
    - PLC Logic
      - Application
        - Library Manager
        - PLC\_PRG (PRG)
        - ST\_POU (PRG)
      - Task Configuration
        - MainTask
          - PLC\_PRG
          - ST\_POU
        - VISU\_TASK
          - VisuElems.Visu\_Prg
      - Visualization Manager
        - TargetVisu
        - WebVisu
        - Visualization

PLC\_PRG MainTask ST\_POU x

```
1 PROGRAM ST_POU
2 VAR
3     Contact1: BOOL;
4     Coill: BOOL;
5 END_VAR
6
```

100 %

```
1 IF contact1 = TRUE THEN;
2     Coill:=TRUE;
3 ELSE;
4     Coill:=FALSE;
5 END_IF;
```

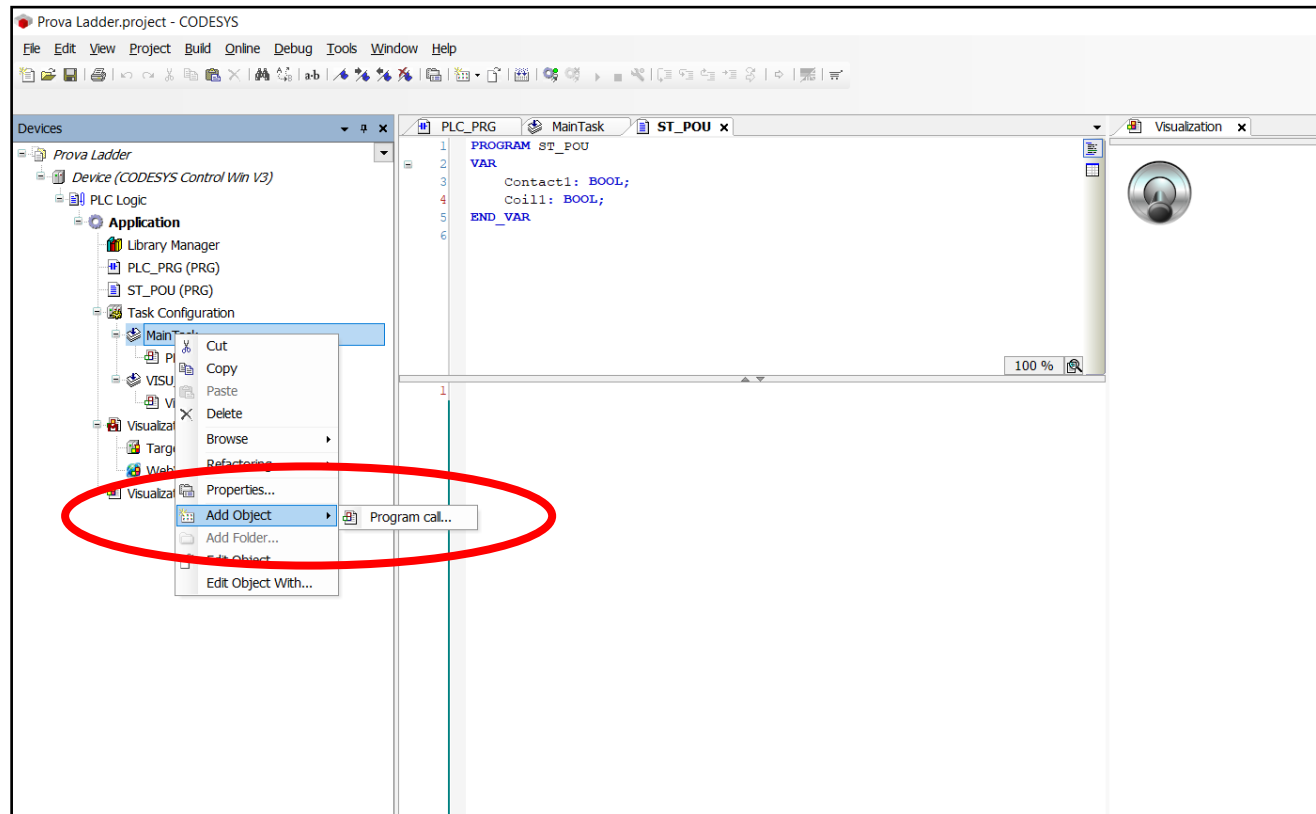
Visualization x





# Are we done? Not yet...

- › We created a POU Program, but we haven't called it yet from within the MainTask...





# Run and set values

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- › If you set `Contact1` to `TRUE`, then `Coil1` goes to `TRUE`
- › ..but the simulated Light & Switch don't turn on!

Why?

- › Because they are **not** attached to those `Contact1` and `Coil1` vars...
- › Look out when you write names...

Should we attach those vars to the two simulated objects?

- › (recommendation) Only if requested by the application specs
- › In this case, I use them for debugging/teaching purposes, so my specs say "no" 😊

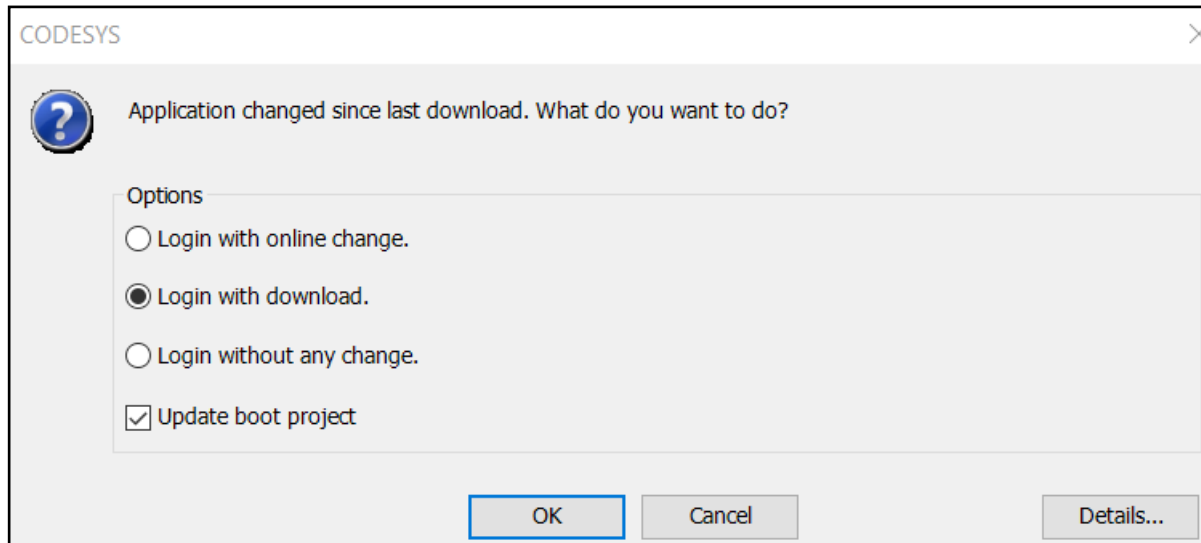


# Compile & Login again

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We added a ST block, so the simulation engine might require some components

› Codesys will prompt us





# Function and Function Blocks

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# Timers

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# Finite state machine

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# References

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## Course website

- › [http://hipert.unimore.it/people/paolob/pub/Industrial\\_Informatics/index.html](http://hipert.unimore.it/people/paolob/pub/Industrial_Informatics/index.html)

## My contacts

- › [paolo.burgio@unimore.it](mailto:paolo.burgio@unimore.it)
- › <http://hipert.mat.unimore.it/people/paolob/>

## Resources

- › Brian Hobby, Codesys tutorials (a must to learn the tool in 5 mins)
- › A small blog
  - [www.google.com](http://www.google.com)