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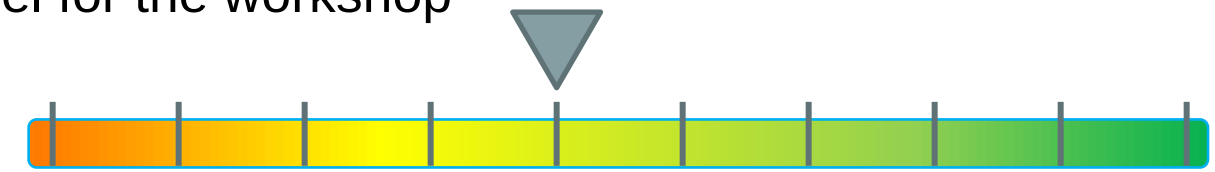
APROL Library Engineering Workshop

Agenda

APROL Library Engineering Workshop

Time	Topic	Presenter
Day 1	Python Tutorial	Marböck Wolfgang
Day 2	Python API for DisplayCenter	Marböck Wolfgang
Day 3	Python API for DisplayCenter, LoginServer, UCB, ListViewWidget	Marböck Wolfgang

Aimed level for the workshop

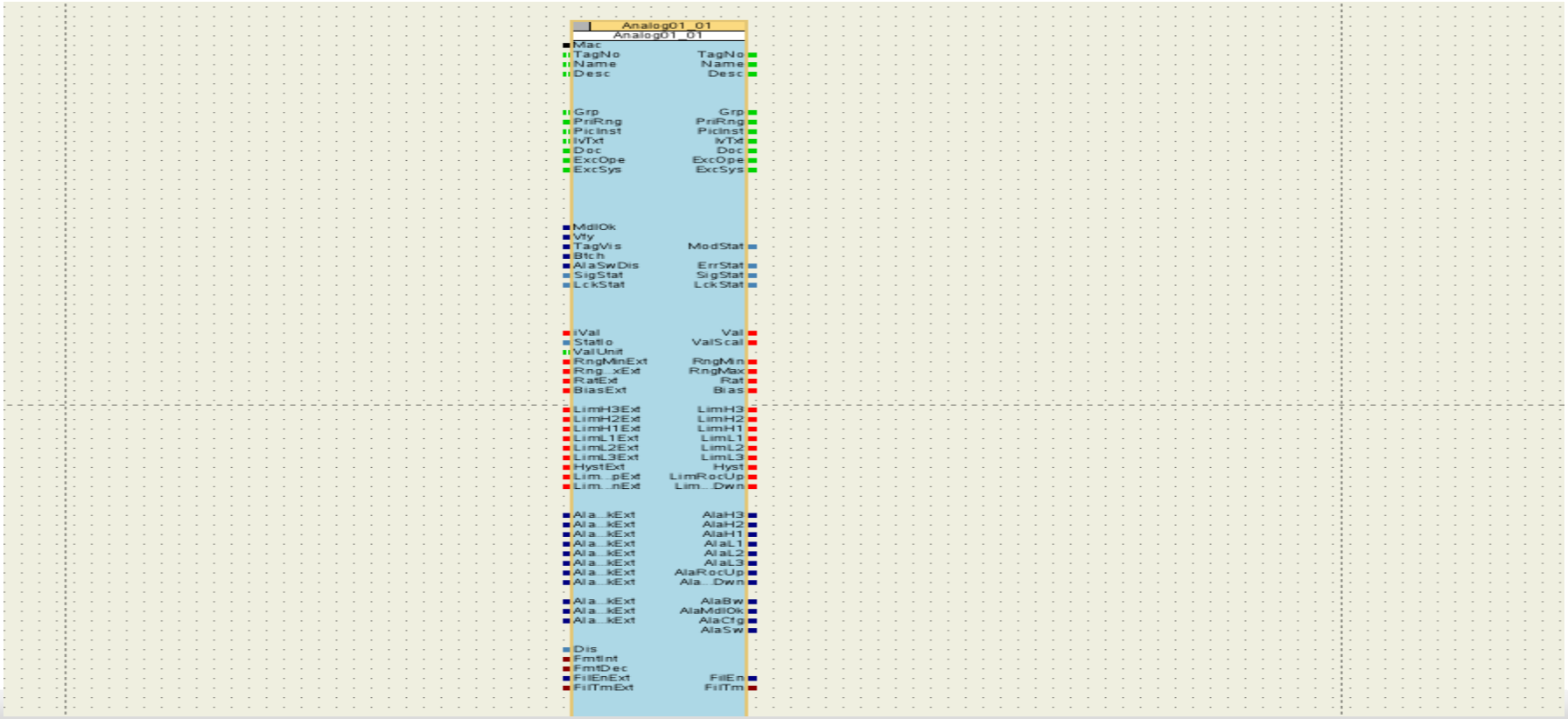


Beginner Expert

APROL Libraries

APROL Libraries basic concepts 1/9

- APROL Hypermacro concept
  - Includes logic functionality (C- FUB)
  - Includes visualization parts (graphic macros, faceplates)
  - Includes control system blocks (alarm, trend)
  - One block per typical, everything inside



APROL Libraries basic concepts 2/9

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Logic

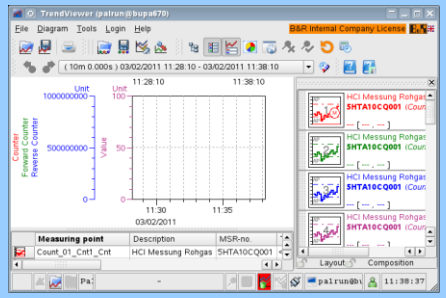
Graphic Macro

MOT_TAG123

Faceplate

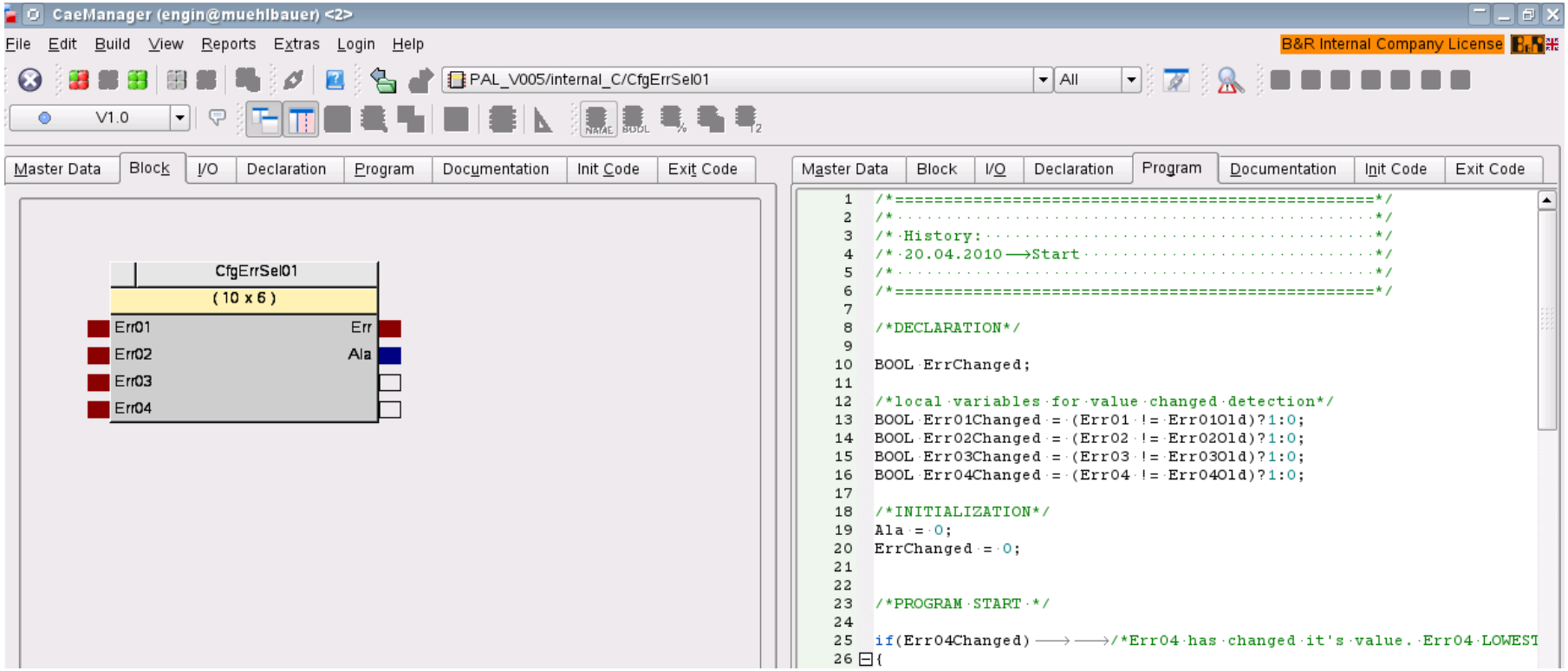
Alarm

Trend



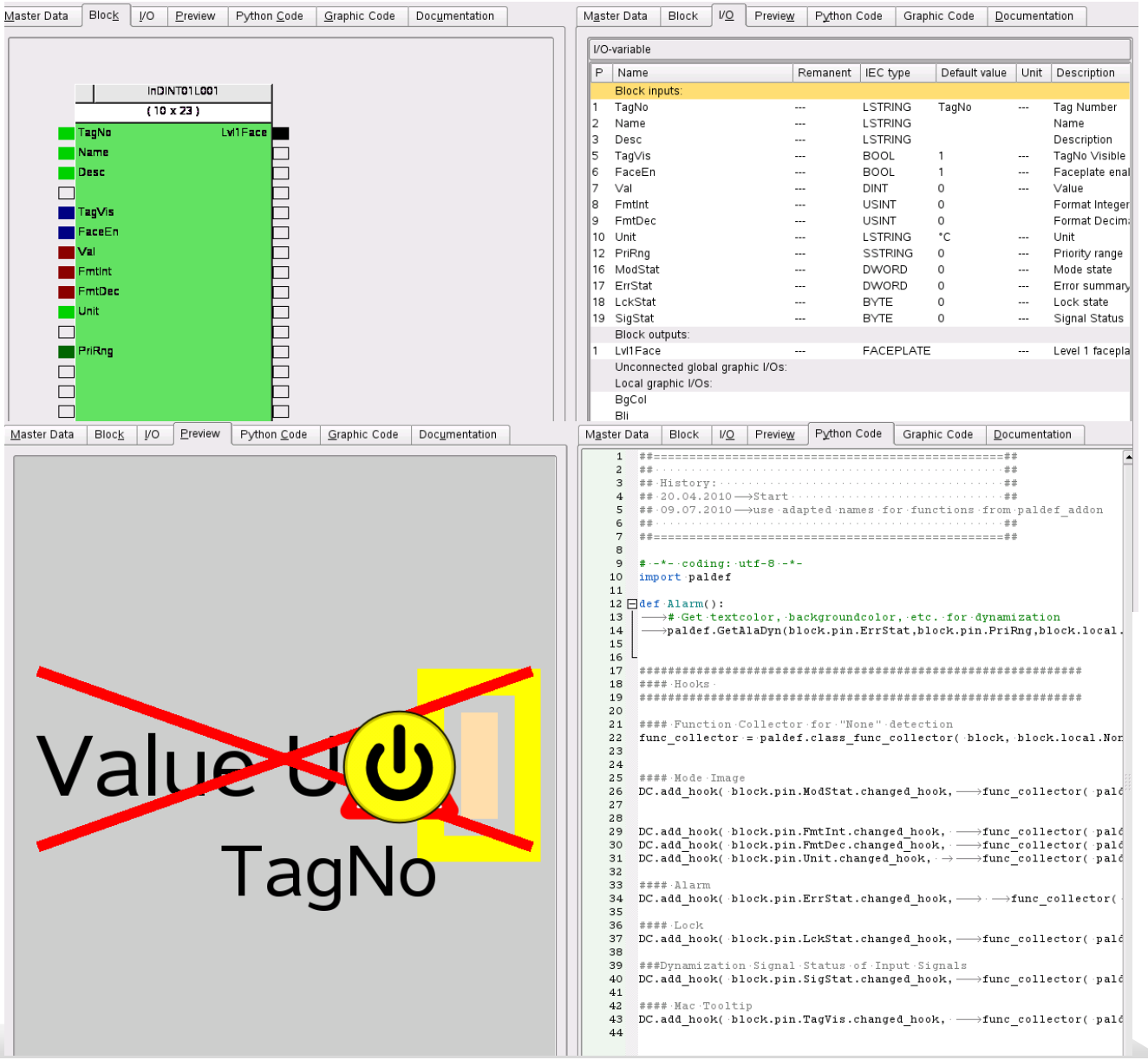
APROL Libraries basic concepts 3/9

- Logic function blocks
  - Pins
  - Code = C programming
  - Documentation B3.2.7
  - Structured text (ST) and Sequential function chart (SFC) also possible



APROL Libraries basic concepts 4/9

- Graphic block
  - Pins
  - Graphical part
  - Python Code
  - Documentation B3.2.8



APROL Libraries basic concepts 5/9

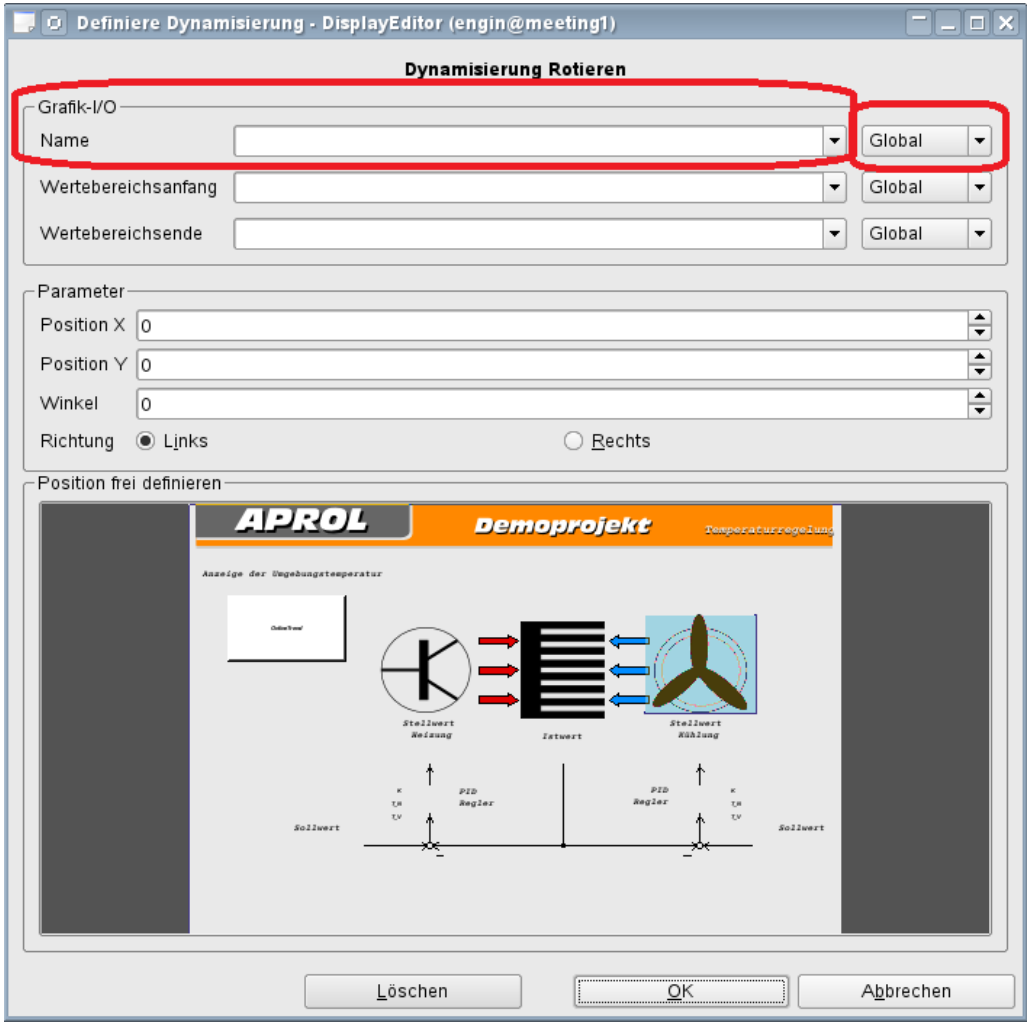
- available animations:

The following are the basic functions available for animation:

Animation type	Description
Blinking	Objects can be blink in many different ways depending on a process variable.
Colors	Objects can change colors depending on a process variable. Background and foreground colors, fill patterns, and line types can be changed.
Rotate	Objects rotate around a definable fixed point depending on a process variable.
Move	Makes it possible to move objects to a different location in the process graphic. Movement along the x-axis can be defined independently of that on the y-axis.
Scale	Objects can change their size depending on two process variables. The x and y axes can be defined independently of one another.
Percent	Objects are trimmed depending on a process variable and no longer displayed in full size.
Text	The actual value of a process variable is displayed. STRING variables can be displayed.
Text list	Defined texts can be displayed depending on a process variable.
Image list	Serves to dynamically display 1 from n images - depending on a process value. E.g. a significant increase in productivity can be reached during the creation of status displays from your system via image (icon).
Invisible	The object is switched invisible.

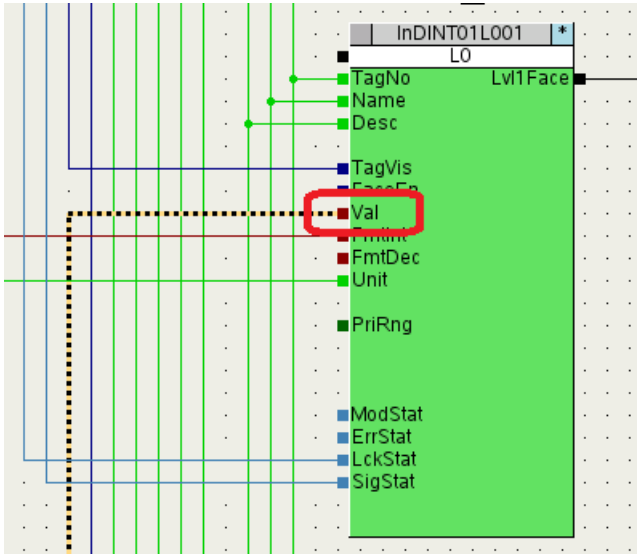
APROL Libraries basic concepts 6/9

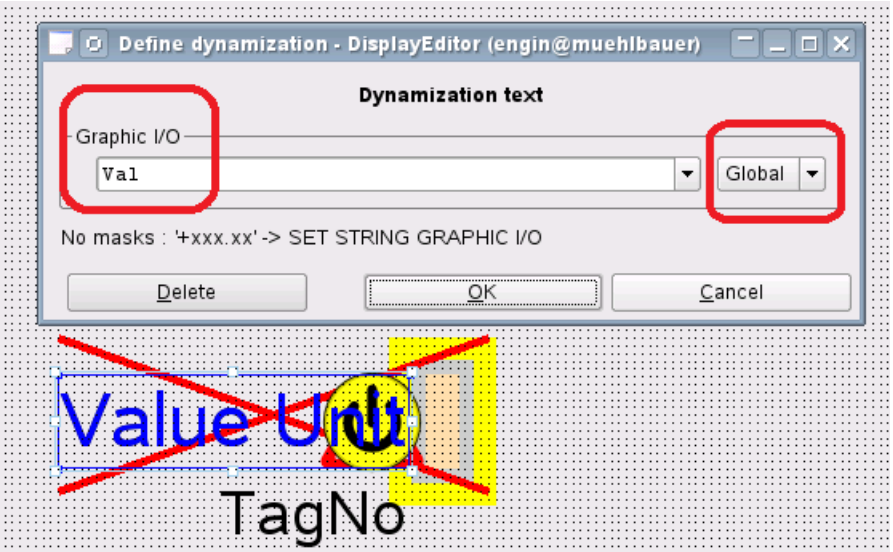
- Apply animation to a graphical element
  - Local/Global graphic IO
  - Documentation
    B3.2.8.2.3



Animation with global graphic IOs

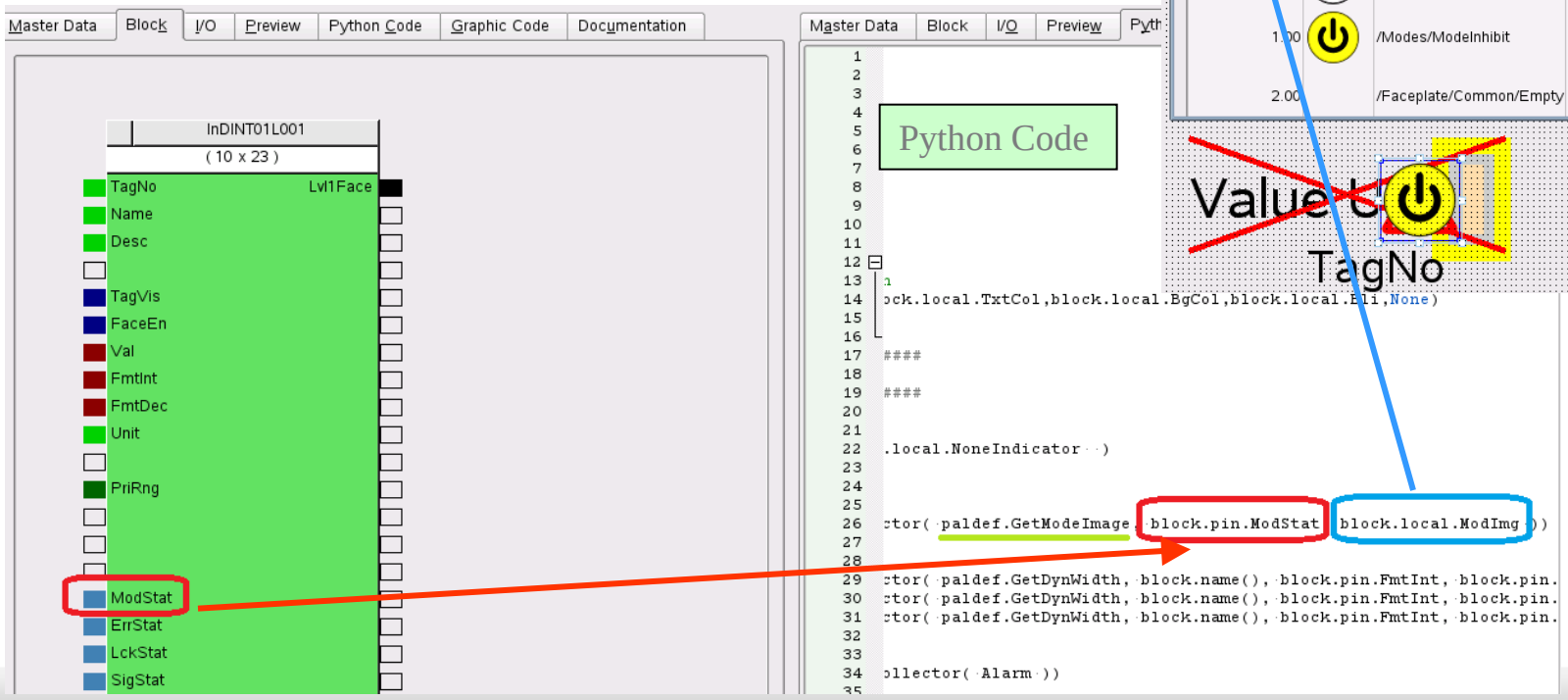
- Use a pin of the graphic block as signal source
- The pin of the graphic block can be connected to a signal coming from a logic block, input pin, gateway io, hm- constant, …





APROL Libraries basic concepts 8/9

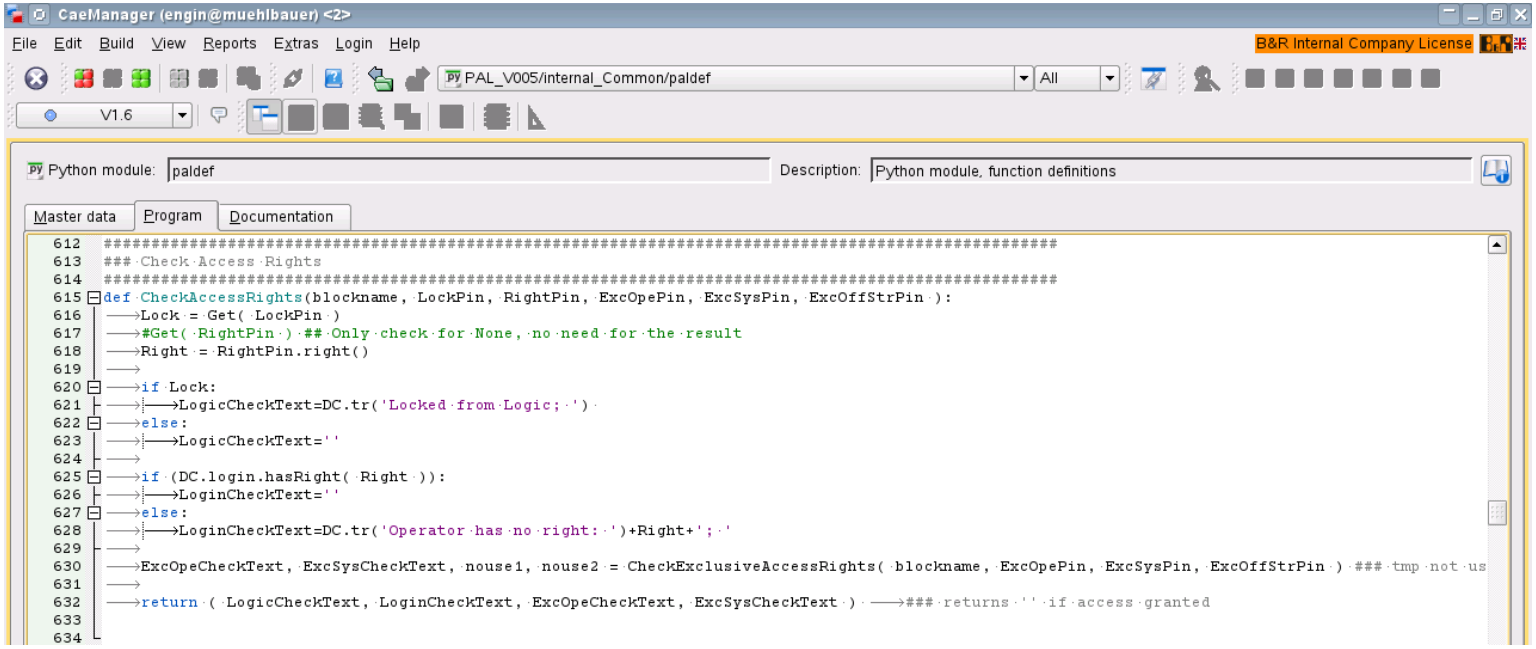
- Animation with local graphic IOs (= Python variables)
  - Use pin(s) of the graphic block in Python Code.
  - The result of the Python Code is a local graphic IO



APROL Libraries basic concepts 9/9

- In general all animations are possible without Python (use global graphic IOs)

- Python is available for extended possibilities with animations
- Python-API gives you access to system events via HOOKS
- Python-API offers FUNCTIONS to perform specific actions



Python

APROL Python 1/1

- Python v2.6
- www.python.org
- APROL Product documentation - X3 - Python Documentation
- APROL Product Documentation - X11 – Python beginners course
- http://openbook.galileocomputing.de/python/ (German)

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Python Tutorial

APROL Python Tutorial 1/14

- Tutorial “A Byte of Python”
  - from http://www.swaroopch.com/notes/Python
  - or http://www.ibiblio.org/swaroopch/byteofpython/read/index.html
- Introduction
  - http://www.ibiblio.org/swaroopch/byteofpython/read/introduction.html
  - simple & powerful
- Features
  - http://www.ibiblio.org/swaroopch/byteofpython/read/features-of-python.html
  - High level language
  - Portable
  - Interpreted
  - Object oriented
  - Extensive libraries

APROL Python Tutorial 2/14

- Using the interpreter
  - http://www.ibiblio.org/swaroopch/byteofpython/read/interpreter-prompt.html
- Using a source file
  - http://www.ibiblio.org/swaroopch/byteofpython/read/source-file.html
- Executable program
  - http://www.ibiblio.org/swaroopch/byteofpython/read/executable-python-programs.html
- Workshop
  - Start python interpreter
  - “Hello World” program with interpreter
  - “Hello World” program with executable source file

- Basics
  - Numbers
    - http://www.ibiblio.org/swaroopch/byteofpython/read/numbers.html
  - Strings
    - http://www.ibiblio.org/swaroopch/byteofpython/read/strings.html
  - Variables
    - http://www.ibiblio.org/swaroopch/byteofpython/read/variables.html
    - http://www.ibiblio.org/swaroopch/byteofpython/read/identifier.html
    - http://www.ibiblio.org/swaroopch/byteofpython/read/data-types.html
  - Objects
    - http://www.ibiblio.org/swaroopch/byteofpython/read/data-type-object.html
  - Logical and physical lines
    - http://www.ibiblio.org/swaroopch/byteofpython/read/logical-and-physical-lines.html
  - Indentation
    - http://www.ibiblio.org/swaroopch/byteofpython/read/indentation.html
  - Operators
    - http://www.ibiblio.org/swaroopch/byteofpython/read/operators.htmlNumbers

- Workshop
  - Test in interactive mode
    - Numbers
    - Strings
    - Variables
    - Objects
    - Logical and physical lines
    - Indentation
    - Operators

- Control Flow
  - if
    - http://www.ibiblio.org/swaroopch/byteofpython/read/if-statement.html
  - while
    - http://www.ibiblio.org/swaroopch/byteofpython/read/while-statement.html
  - for
    - http://www.ibiblio.org/swaroopch/byteofpython/read/for-loop.html
  - break
    - http://www.ibiblio.org/swaroopch/byteofpython/read/break-statement.html
  - continue
    - http://www.ibiblio.org/swaroopch/byteofpython/read/continue-statement.html

- Workshop
  - Test with program samples from documentation
    - if
    - while
    - for
    - break
    - continue

- Functions
  - http://www.ibiblio.org/swaroopch/byteofpython/read/function-parameters.html
- Functions with optional parameters
  - http://www.ibiblio.org/swaroopch/byteofpython/read/default-argument-values.html
- Functions with keyword arguments
  - http://www.ibiblio.org/swaroopch/byteofpython/read/keyword-arguments.html
- Return Statement
  - http://www.ibiblio.org/swaroopch/byteofpython/read/return.html

- Workshop
  - Test with program samples from documentation
    - functions
    - functions with optional parameters
    - functions with keyword parameters
    - functions with return value

- Modules
  - http://www.ibiblio.org/swaroopch/byteofpython/read/modules.html
- The dir() function
  - http://www.ibiblio.org/swaroopch/byteofpython/read/dir.html

- Workshop
  - Import the module “math”
  - Use attribute “pi” of the module
  - Use the dir function for the module “math”

- Data structures
  - List
    - http://www.ibiblio.org/swaroopch/byteofpython/read/list.html
    - Square brackets [ ]
    - mutable
- Workshop
  - Define a shopping list
  - Use the append-method
  - Use the remove-method
  - Use the sort-method
  - Use the reverse-method

- Data structures
  - Tuple
    - http://www.ibiblio.org/swaroopch/byteofpython/read/tuple.html
    - Round bracket ( )
    - immutable
- Workshop
  - Define a tuple
  - Use the count-method

- Data structures
  - Dictionary
    - http://www.ibiblio.org/swaroopch/byteofpython/read/dictionary.html
    - Pairs of key:value
    - Curly brackets { }
    - keys need to be immutable
    - keys need to be unique
    - values can be either mutable or immutable
- Workshop
  - Define a dictionary
    - Key should be a name
    - Value should be be phone number
  - Print the number of elements in the dict with the function len()
  - Use the keys-method; value-method
  - Delete one element of the dictionary using “del” operator

- Sequences
  - http://www.ibiblio.org/swaroopch/byteofpython/read/sequences.html
  - List, tuple, string
    - Indexing
    - Slicing
- Workshop
  - Define a shopping list
  - Try indexing
  - Try slicing

- Standard libraries
  - Extensive standard libraries – “Batteries included”
  - http://docs.python.org/tutorial/stdlib.html#
  - Examples:
    - math: sin, exp, log, pow, pi, …
    - random
    - os.path: dirname, exists, ..
    - csv: csv-file reading and writing
    - os: environ, listdir, mkdir, remove, rename

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