Using Tkinter of Python to create Graphical User Interfaces (GUI) for scripts in LNLS

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Python is being widely used to create scripts which cover different necessities in computational scenario. At LNLS we successfully developed Python scripts to control beamlines operations, including a case of GUI (*Graphical User Interface*) creation using Tkinter, which is the standard GUI programming toolkit of Python, for one of our beamlines, DXAS (*Dispersive X-ray Absorption Spectroscopy*). Tkinter offers the basic components necessary to build a GUI that help users to quickly inform a set of parameters defining which device to use, its configuration to set, among others, and to easily start or stop operations.

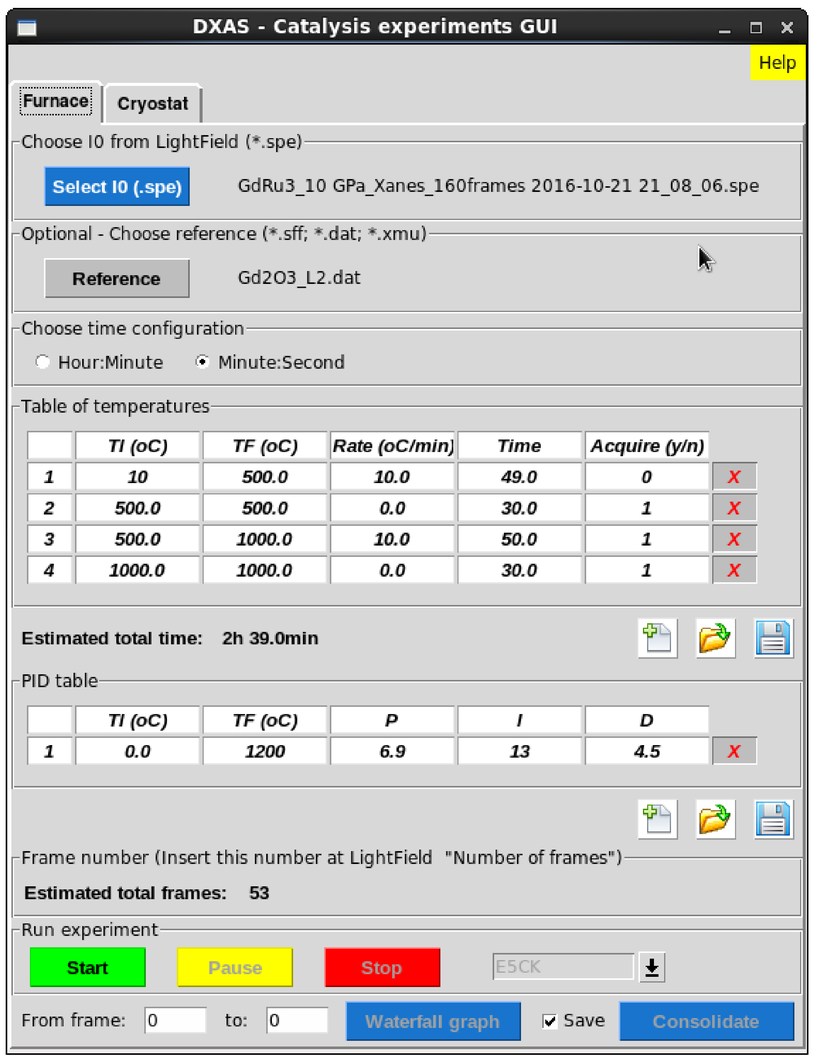
Why Python?

- Widely used in many different applications, including synchrotron laboratories
- Almost all LNLS beamlines have Python scripts being used to control their operations since we developed Py4Syn package to abstract EPICS (*Experimental Physics and Industrial Control System*) IOC (*Input/Output Controller*) to be used with that language facilities
- Easy integration to EPICS via PyEPICS library of CARS
- Perform mathematical calculations and data matrix manipulation, with NumPy
- Flexibility with many libraries that help to build graphical interfaces

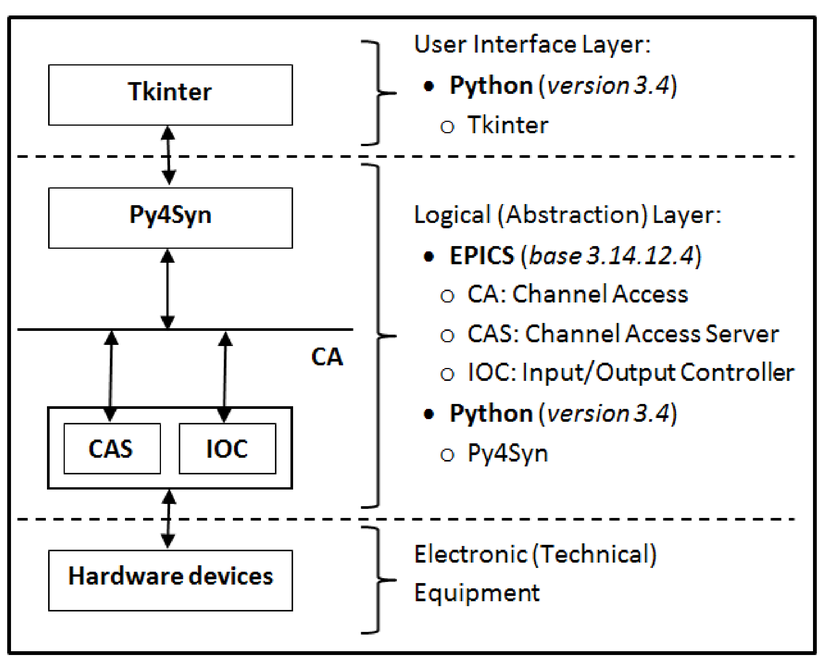
Why Tkinter?

- It is standard GUI (*Graphical User Interface*) package of Python
- Facility to build interfaces and large number of examples and tutorials in the Internet helping to work with it
- Widgets, geometry management and event handling are the three main Tkinter concepts and meet the needs

Tkinter Solution of DXAS



Architecture Overview



Source Code Excerpts

magnetic_dxas.py

```
236
237  # ------------------------------------------------------------
238  self.buttonsFrame = LabelFrame(self.master, text = 'Run experime
239  self.buttonsFrame.pack(side = TOP, fill = X, pady = 2, ipadx = 2
240  self.startButton = Button(self.buttonsFrame,
241                            command = self.StartExperiment,
242                            text = "Scan",
243                            font = textFont4,
244                            background = "green",
245                            fg="black",
246                            state = DISABLED,
247                            height = 1,
248                            width = 8)
249  self.startButton.pack(side = LEFT, anchor = W, padx = 10, pady =
250  self.stopButton = Button(self.buttonsFrame,
251                            command = self.StopExperiment,
252                            text = "Cancel",
253                            font = textFont4,
254                            background = "red",
255                            fg="white",
256                            state = DISABLED,
257                            height = 1,
258                            width = 8)
259  self.stopButton.pack(side = LEFT, anchor = W, padx = 10, pady =
```

*e5ck.py

```
231
232  def callback_curr_temp():
233      try:
234          self._currTemp.set(round(self.furnaceDevice.getValue(),
235          self._currPower.set(round(self.furnaceDevice.getPower()
236          self._currP.set(round(self.furnaceDevice.getP(),2))
237          self._currI.set(round(self.furnaceDevice.getI(),2))
238          self._currD.set(round(self.furnaceDevice.getD(),2))
239      except (ValueError, TypeError):
240          pass
241      global processRunning
242
243      # Updates total time
244      try:
245          totalFurnace = self.__get_total_program_time()
246          if (self._radioTime.get()==0):
247              totalFurnace = totalFurnace * 60
248          self.Furnace_Table._totalTime.set(str(round(totalFurnac
249      except:
250          pass
251
252      # And update it every 1 second later
253      self.master.after(1000, callback_curr_temp)
254  # Trigger of callback (point of return)
255  self.master.after(1000, callback_curr_temp)
256
```

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