Graphical User Interfaces

Tkinter

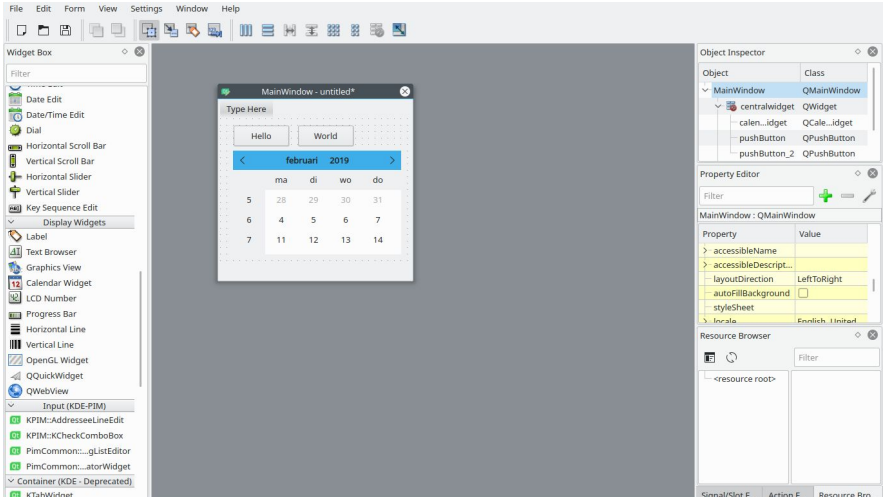
Why Tkinter?

- Comes with Python
- Cross platform
- Mature and stable (over 30 yrs old!)
- Sufficient for small, lightweight GUIs
- Offers a glimpse at core principles of a GUIs

Tkinter

Why Not Tkinter?

- Lacks modern widgets (components)
- Does not have a GUI designer
- Slower than other options
- Does not support accessibility

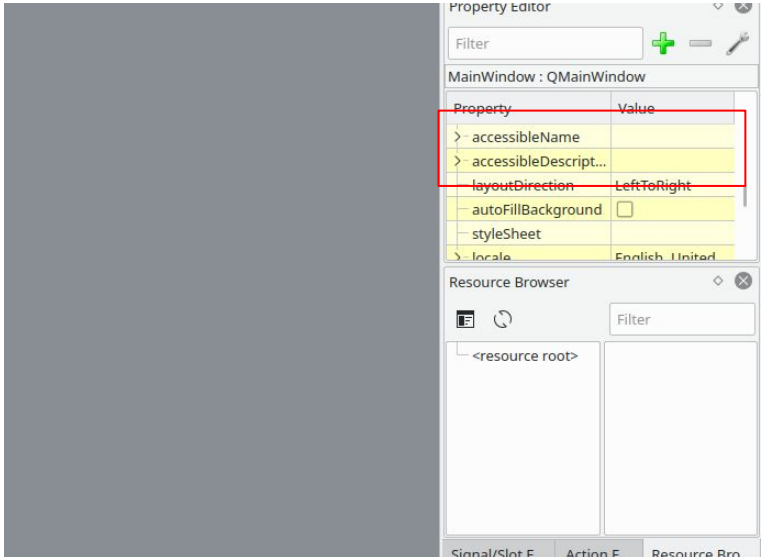


Python GUI designer in QT

Tkinter

Why accessibility?

- Any program designed to be used by the population at large should be accessible.
- In GUI design, accessibility means that the accessibility layer of the OS can interpret and act upon GUI widgets without user intervention.



Python GUI designer in QT

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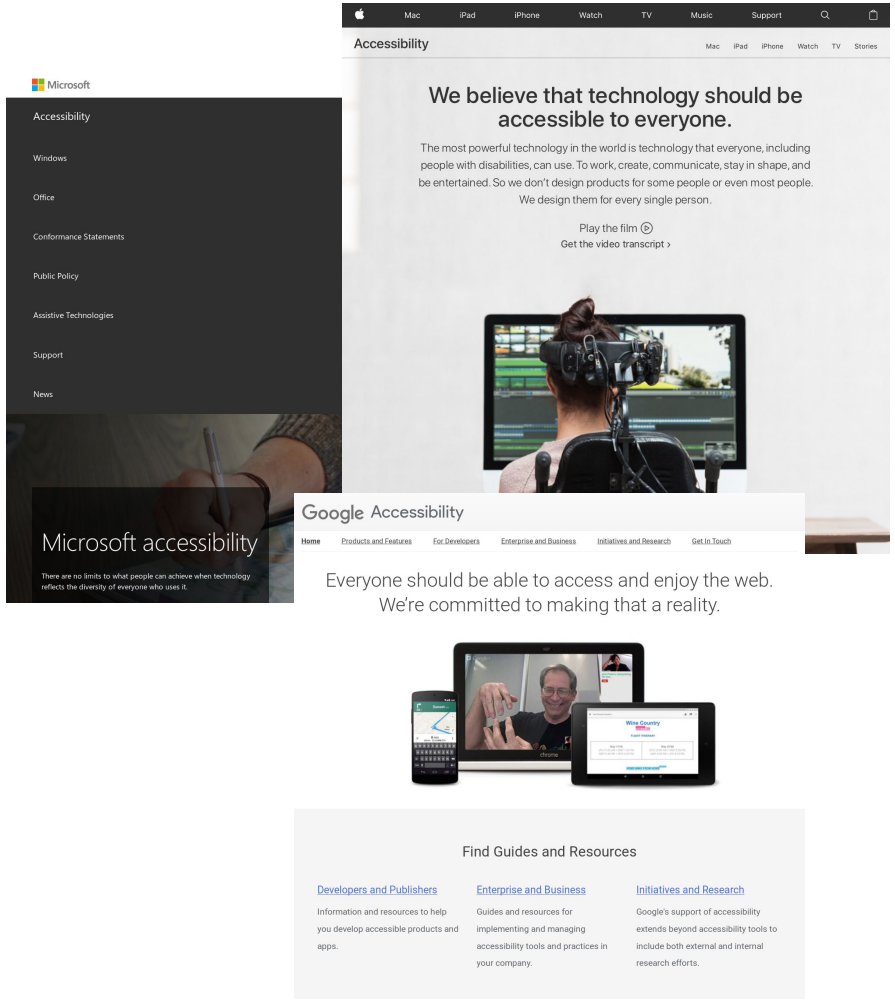
Why accessibility?

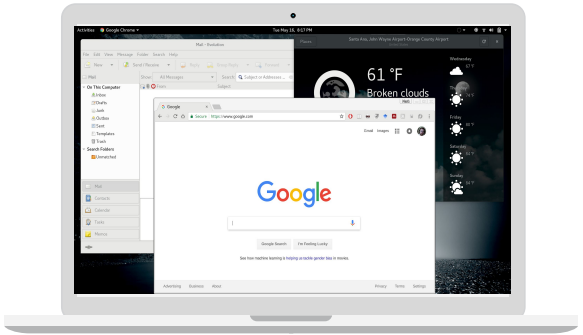
- All major software producers have accessibility initiatives and look for developers with accessibility experience.
- But also, many software producers do not. THEY NEED YOUR HELP.



Tkinter

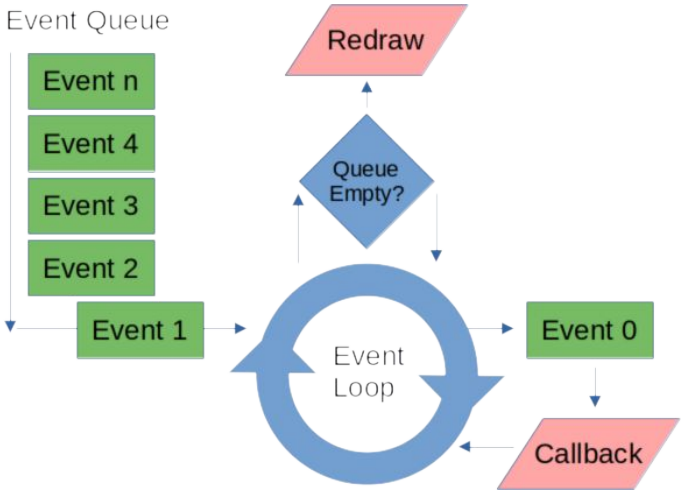
What is accessibility?

- Ensuring people with disabilities can access and interact with graphical user interfaces.
- Includes, visual impairments, auditory impairments, cognitive and motor impairments.



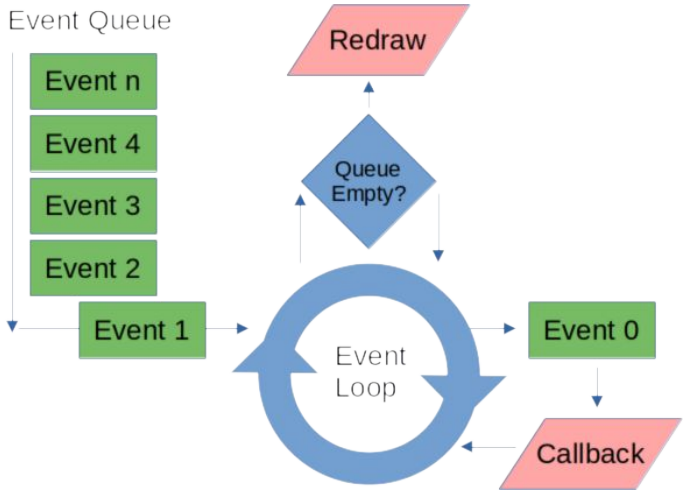
The Event Loop

- In graphical interface programming, screen updates are processed in an event loop.
- As each graphical element (widget) is acted upon, it is put into an event queue, and must wait its turn to be executed.



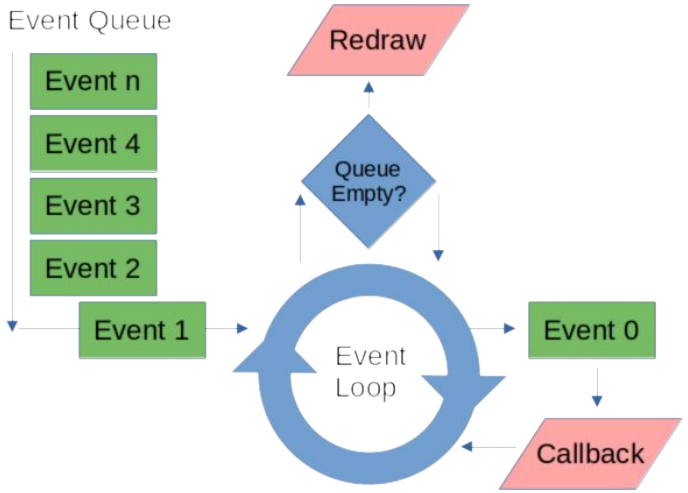
The Event Loop

- Once all events in the queue are processed, the event loop initiates a redraw or updates the screen.
- These events often go unnoticed because they occur so quickly.
- Until some other process takes a long time.



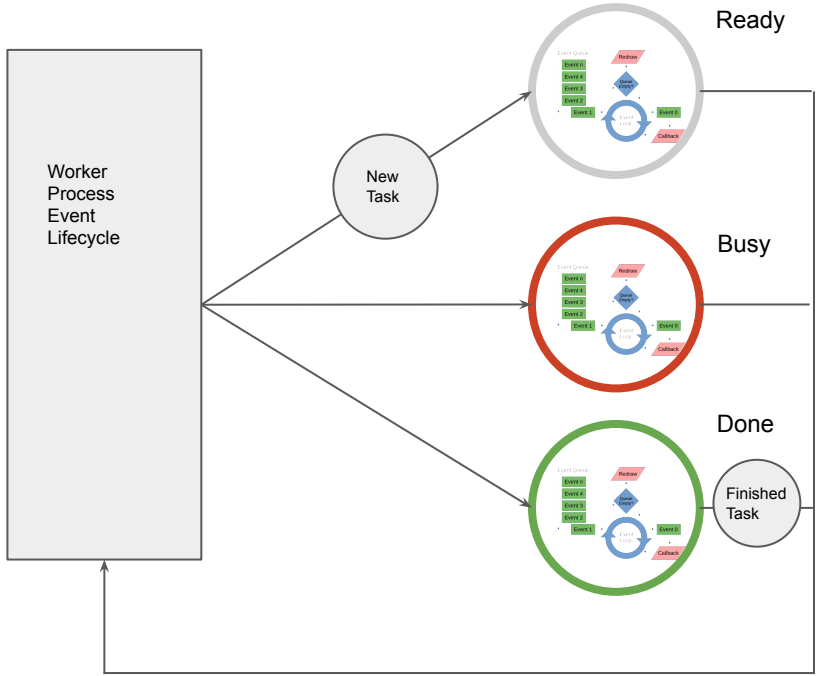
The Event Loop

- Demo



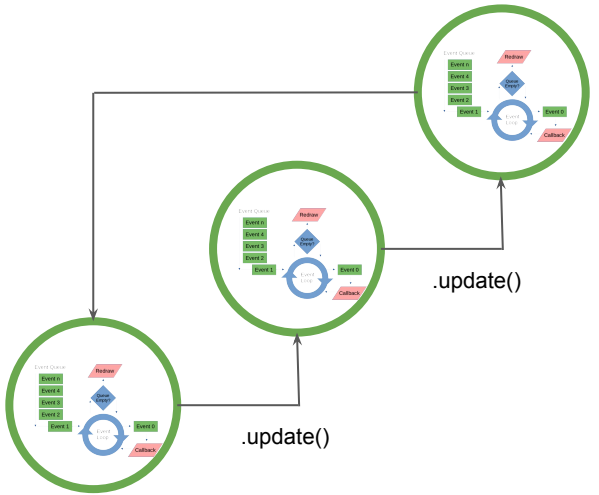
The Event Loop

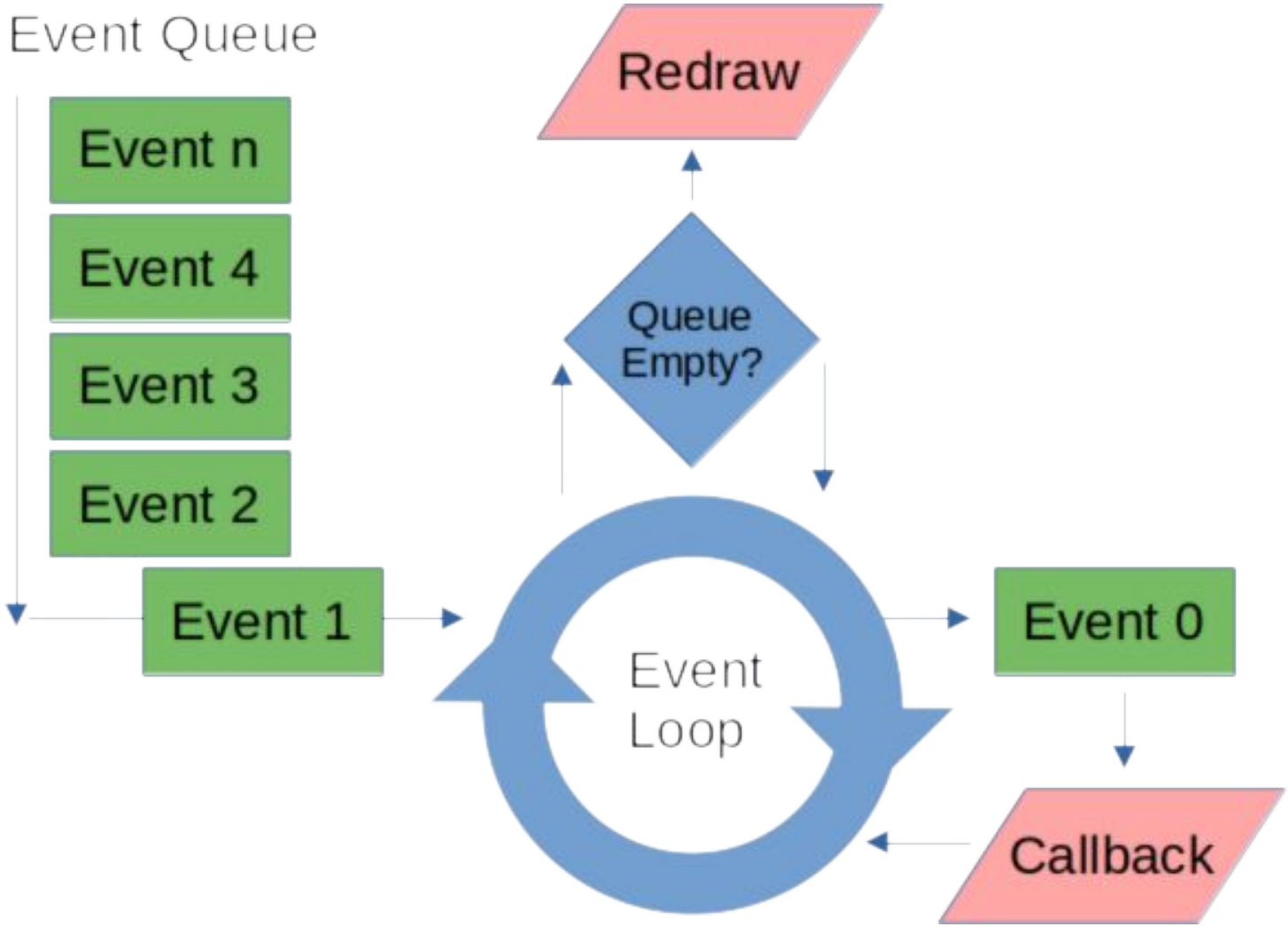
- Wait...What's a thread!?
  - Threads enable multiple processes to run at the same time.
  - Get complicated quickly.
  - Require special coding to share information
  - Way beyond the scope of ICS 32!



The Event Loop

- A simple fix, suitable for ICS 32.
  - update() and update_idletasks()
    - Start a new event loop, nested within the existing one.
    - Forces event processing by starting a new event loop.
    - Update_idletasks is the same as update, but only processes screen redrawing, not other events in queue.
  - USE SPARINGLY! Nested event loops can quickly grow out of control and render unexpected results in your program.




Event Queue
Event n
Event 4
Event 3
Event 2
Event 1
Redraw
Queue Empty?
Event Loop
Event 0
Callback