Qiskit Advocate Mentorship Program

Timeline debugger for the Qiskit transpiler

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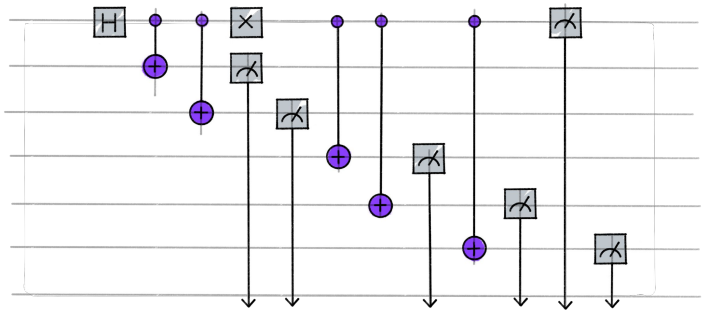
Qiskit

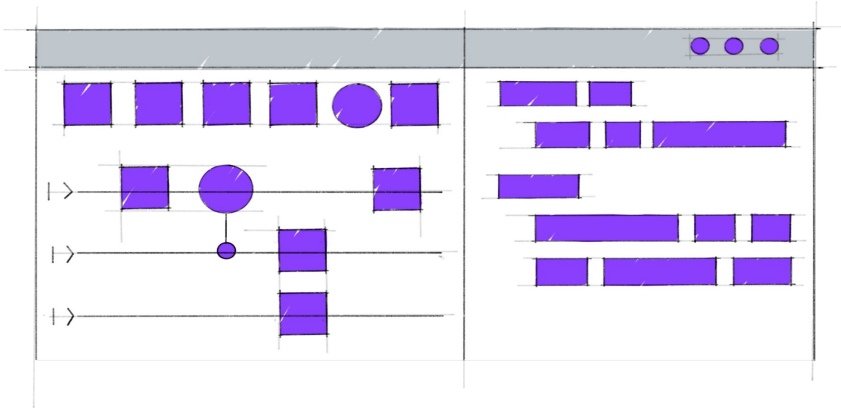
What is Transpiler Debugger

- The Qiskit transpiler and `PassManager` have built-in logging and callback mechanisms to help users understand what changes are being made to their circuit, at which stage in the process, and why.
- These tools are invaluable in investigating and debugging issues in the transpiler.
- However, most users don’t know about these tools, or don’t have (and shouldn’t need!) the deep transpiler knowledge to know how to use them.
- This is where this project can have substantial impact, providing an insight into the qiskit transpiler.



Goals of the Transpiler Debugger

- Provides users with an understandable interface to **interact** with the transpiler.
- Helping users to **find** which passes are responsible for the large changes in overall circuit properties: depth, basis, duration, or seeing these properties (and their changes pass by pass)
- Helping users to **understand** the transpilation process (which passes ran when, were responsible for which changes to a circuit, ...)
- Guiding users during debugging sessions by collecting all the data they need to **investigate** the issue, identify the root cause, and fix it.



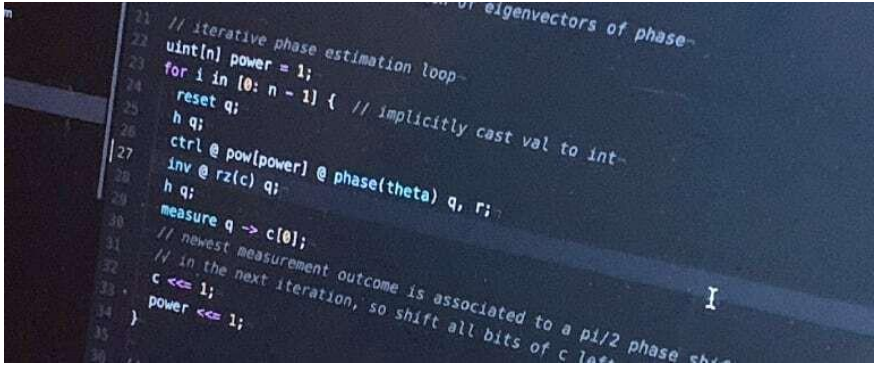
Progress

- Functional requirements discussed in detail.
- Iterative design approach (Design – Prototype – Evaluate – Repeat)
- Developed a functioning prototype for debugging a single circuit
- Current state is a jupyter widget which is invoked by the user in place of the transpile method.
- Incorporated dynamic loading to make it memory efficient
- Working on the final development

Challenges

- In case of multi-circuit transpilation, how to separate data related to each circuit mainly logs generated by the circuits.

- Highlighting changes made by each transpiler pass in case of circuits with large number of circuits without suffering from bad performance.



Thank You!