EE/ CprE/ SE 492 - sddec23-17

Simulated Design of Quantum Networks

Biweekly Status Report

September 3 - September 17

Client: Dr. Durga Paudyal

Faculty Advisor: Dr. Durga Paudyal

Team Members:

Benjamin Amick - Network security engineer

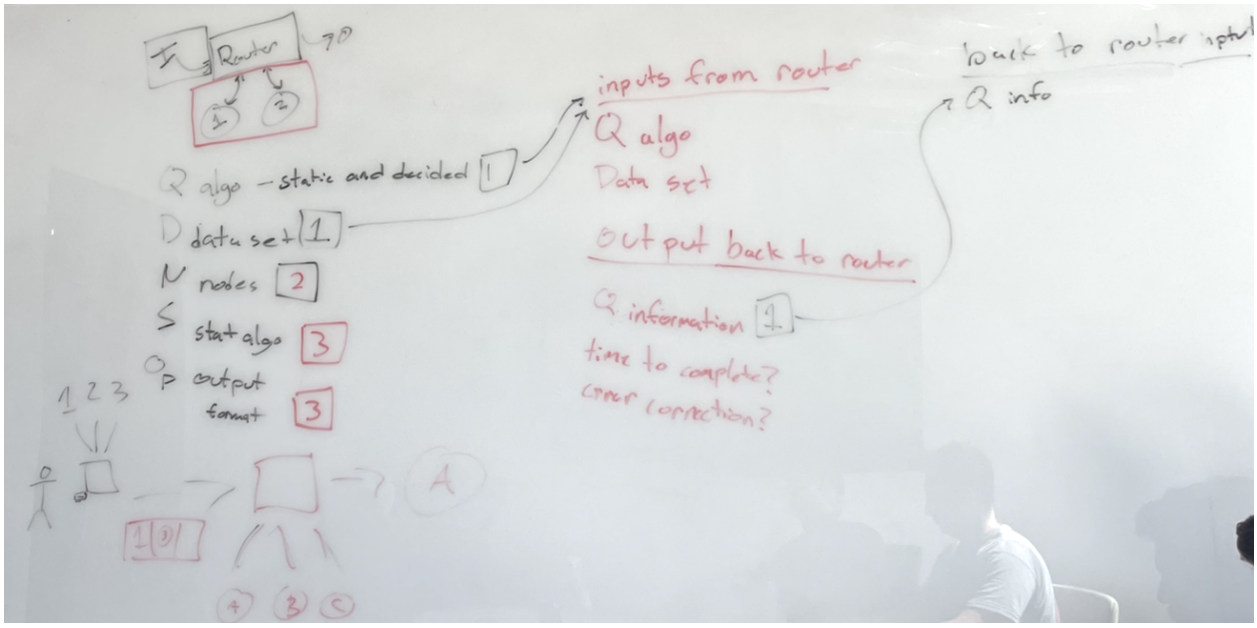
Derrick Wright - System integration engineer

Ohik Kwon- System component designer

Steven Tompary- Network engineer

Past Week Accomplishments

Since the beginning of our final semester, we have followed up again what we have done and our design diagram and design report from senior design 1 report. And as we always did, studied quantum computing and network study. From summary works, we all agreed on our first version of our network with the meeting of our advisors which is the same as below drawing.



[figure : simple description of our network.]

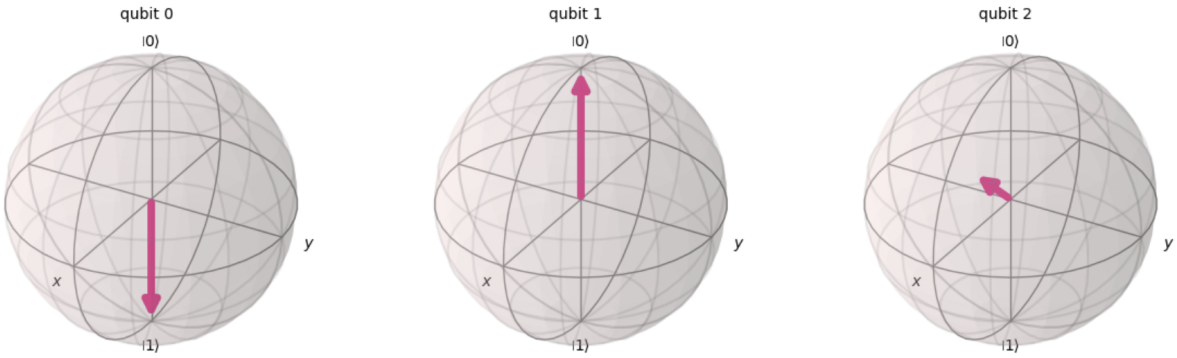
Fixed functionality of our network will handle following:

- It will receive simple quantum computation work from a user with some input quantum data.
- Then it will assign the same job to several nodes for calculation. Each node will calculate the same job, but might have different output due to the quantum nature.
- After each node finishes to compute the quantum algorithm, the router collects data and summarizes the result, giving it to the user.

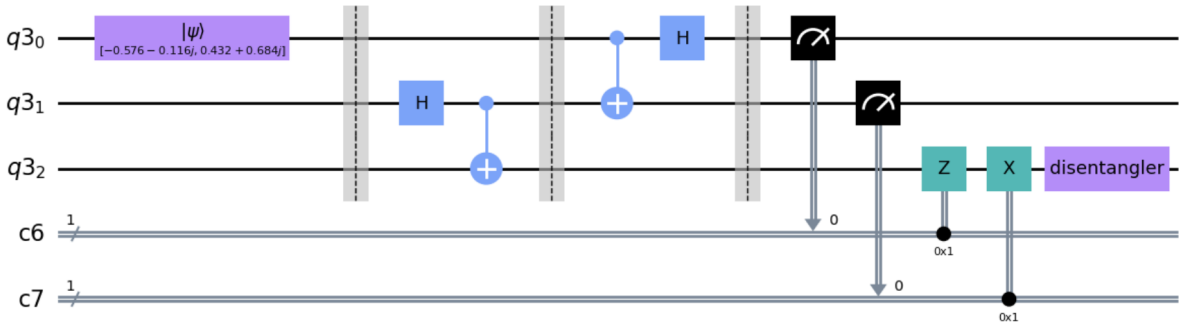
- **Ben** - Found EPR pair communication network paper and designed and proposed quantum network diagram at the meeting with steven.

- **Ohik** - Made simple simulation of 1 qubit quantum communication wire. It will be used as a quantum communication wire inside of our network.

```
backend = BasicAer.get_backend('statevector_simulator')
out_vector = execute(qc, backend).result().get_statevector()
plot_bloch_multivector(out_vector)
```



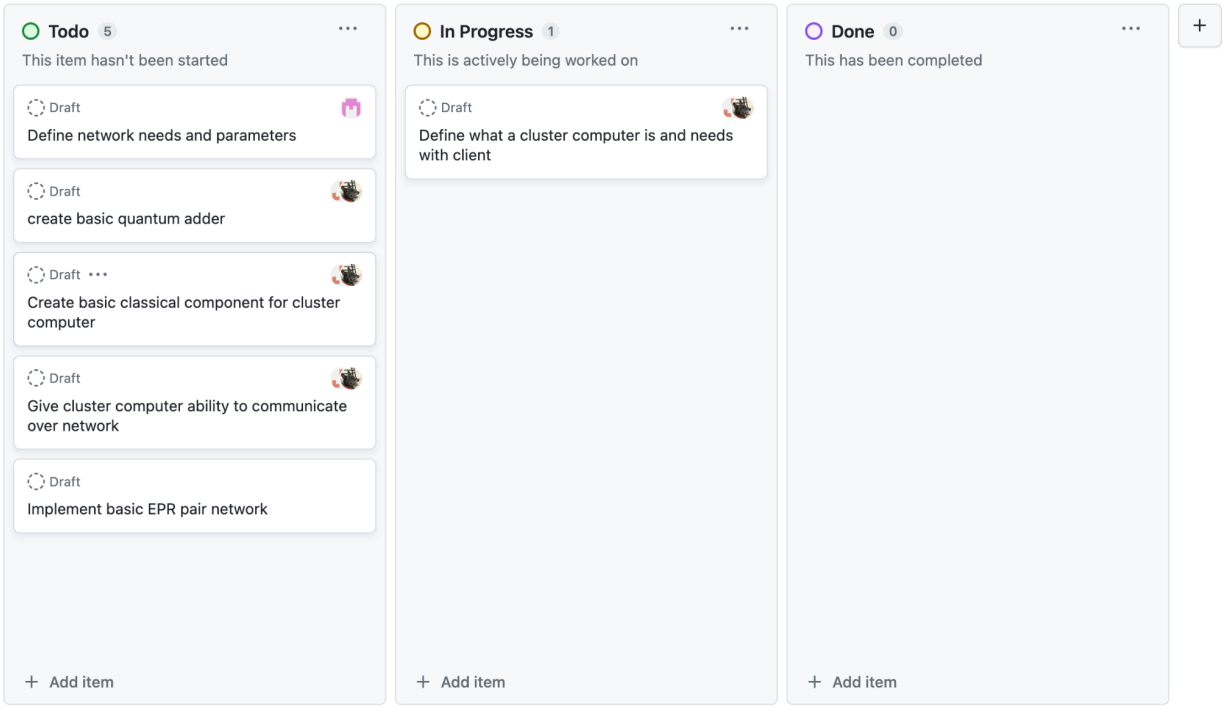

```
inverse_init_gate = init_gate.gates_to_uncompute()
qc.append(inverse_init_gate, [2])
qc.draw(output='mpl')
```



[figure : basic quantum communication wire which will be used in our network.]

- **Steven** - designed and proposed quantum network diagram at the meeting. Designed handshake protocol for the network.

- **Derrick** - Reviewed the Qiskit documentation for the system integration. Read EPR pair communication paper. Set a development setting and project management setting on a git repository.



[figure : our github repository project manager.]

Resources

Slides we used during a meeting
https://drive.google.com/drive/folders/1ak2itlwFekr-7PEOE5iNCYHPrqHcqYdv?usp=sharing
Our git repository
https://github.com/Kcops11/SeniorDesignQuantum17

Books we are reading

- Quantum Computation and Quantum Information, Michael A. Nielson

Articles we found this week and reading

- Github Qiskit Community Tutorials
- When Entanglement meets Classical Communications: Quantum Teleportation for the Quantum Internet, IEEE Transactions on Communication, 2020, 10.1109/TCOMM.2020.2978071

Pending Issues

- There are no pending issues for this week since we all agreed on detailed functionalities of our first iteration network.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Benjamin Amick	Work on cluster computing architecture	5	46
Derrick Wright	Researched Qiskit / Read EPR pair paper	5	46
Ohik Kwon	Built EPR pair communication system	5	46
Steven Tompary	Work on cluster computing architecture	5	46

Plans for Coming Week

- Share individual research about quantum networks - everyone
- Trim the EPR pair methods and build a simple simulation framework for our network - Derrick.
- Design and make a network packet for our network router which will be used for the first iteration of our network - Ben and Steven.
- Study and pick a simple quantum algorithm which will be used for our first iteration simulation of our network. - Ohik.