บทที่ 7 WHAT IS CISCO DOING?

ผู้ช่วยศาสตราจารย์จุฑาวุฒิ จันทรมาลี

หลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาวิทยาการคอมพิวเตอร์
คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยสวนดุสิต

Key Engineering Challenges in Quantum Computing & Networking

Developing Larger Quantum Computers
Current Record: 1180 qubits

Achieving Longer Quantum Coherence
Current Record: 343 ms

Requiring Fewer Qubits for Error Correction
Current Record: 48

Extending Entanglement
Current Record: 248 km

Raising Operating Temperatures

Achieving Longer Quantum Memory

Improving Quantum Transmission Fidelity

Planning & Modelling Quantum Networks

Developing Quantum Network Protocols

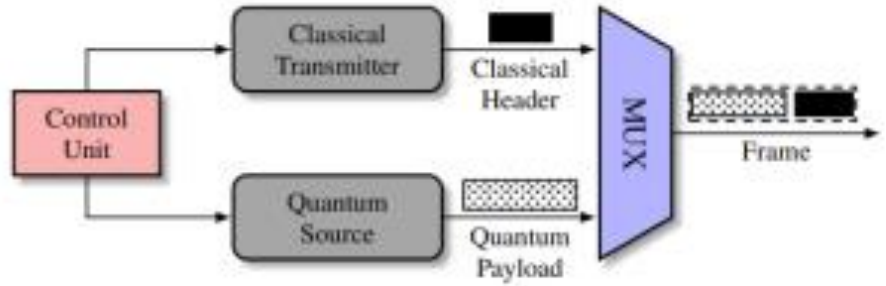
Lowering Costs

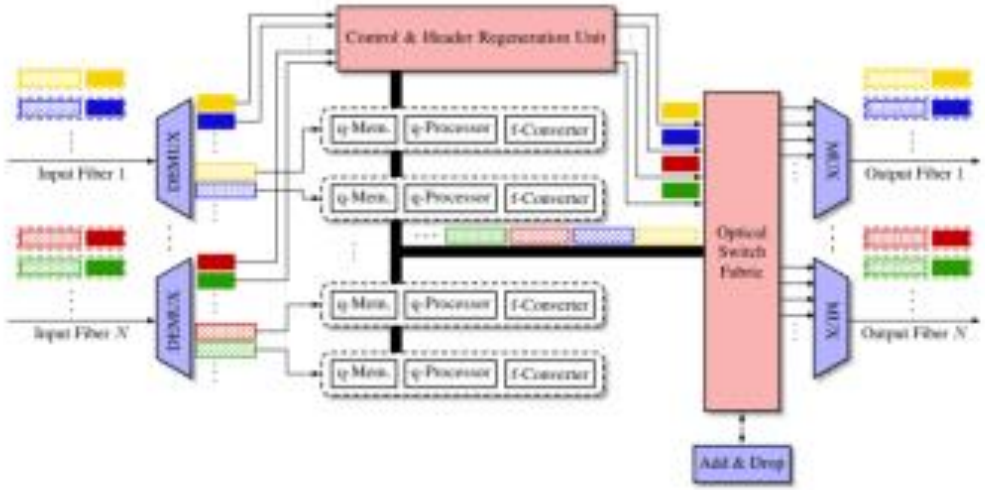
Steps to Building a Quantum Internet

1) Research & Mathematical Modelling
2) Quantum Simulation
3) Lab testing

Modelling a Unified Classical & Quantum Internet

- "We are now with Quantum Internet where we were with the classical Internet in the 1960s"
- The Cisco Research team has published a paper on how can we design a network that can serve thousands and eventually millions of end nodes

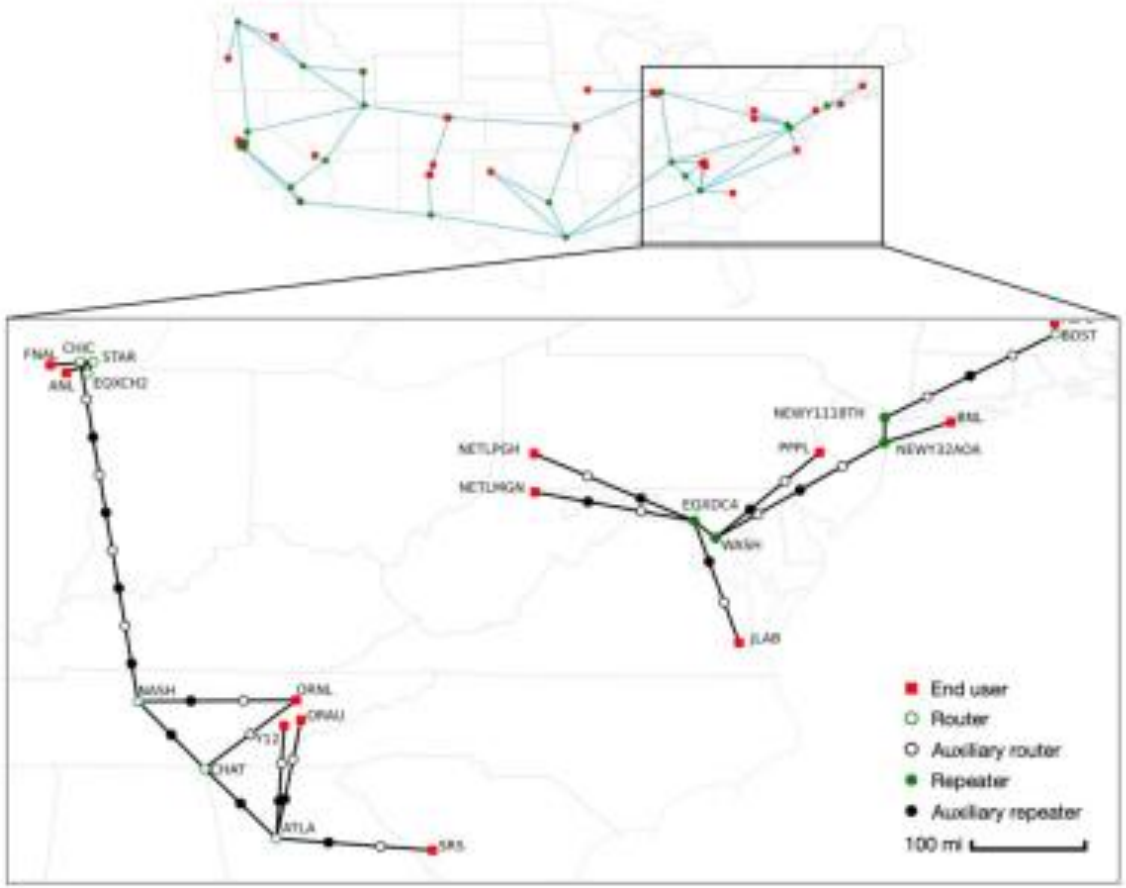




https://outshift.cisco.com/blog/making-a-quantum-ready-internet
https://arxiv.org/abs/2205.07507

Planning Quantum Networks Over Existing Fiber Networks

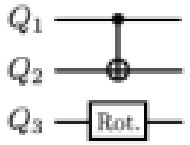
- In another paper, the Cisco Research team developed a framework to guide the first steps of planning a quantum network using the existing optical network infrastructure
- This framework was formulated as an optimization problem
  - Specifically as an Integer Linear Programming (ILP) problem

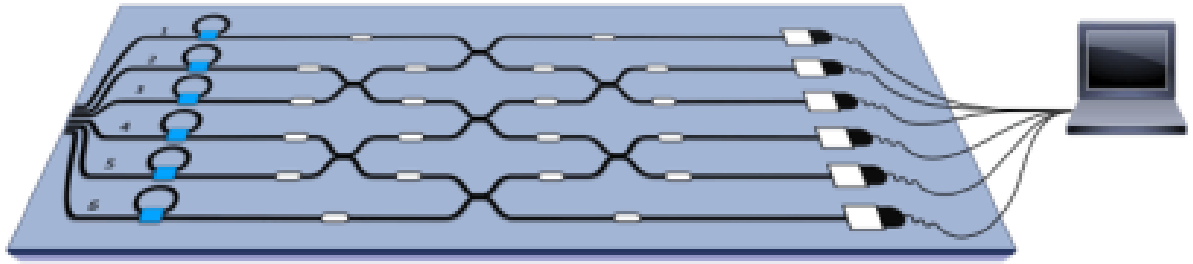


https://outshift.cisco.com/blog/first-steps-to-quantum-network-planning
https://arxiv.org/abs/2308.16264

Photonic Quantum Processors

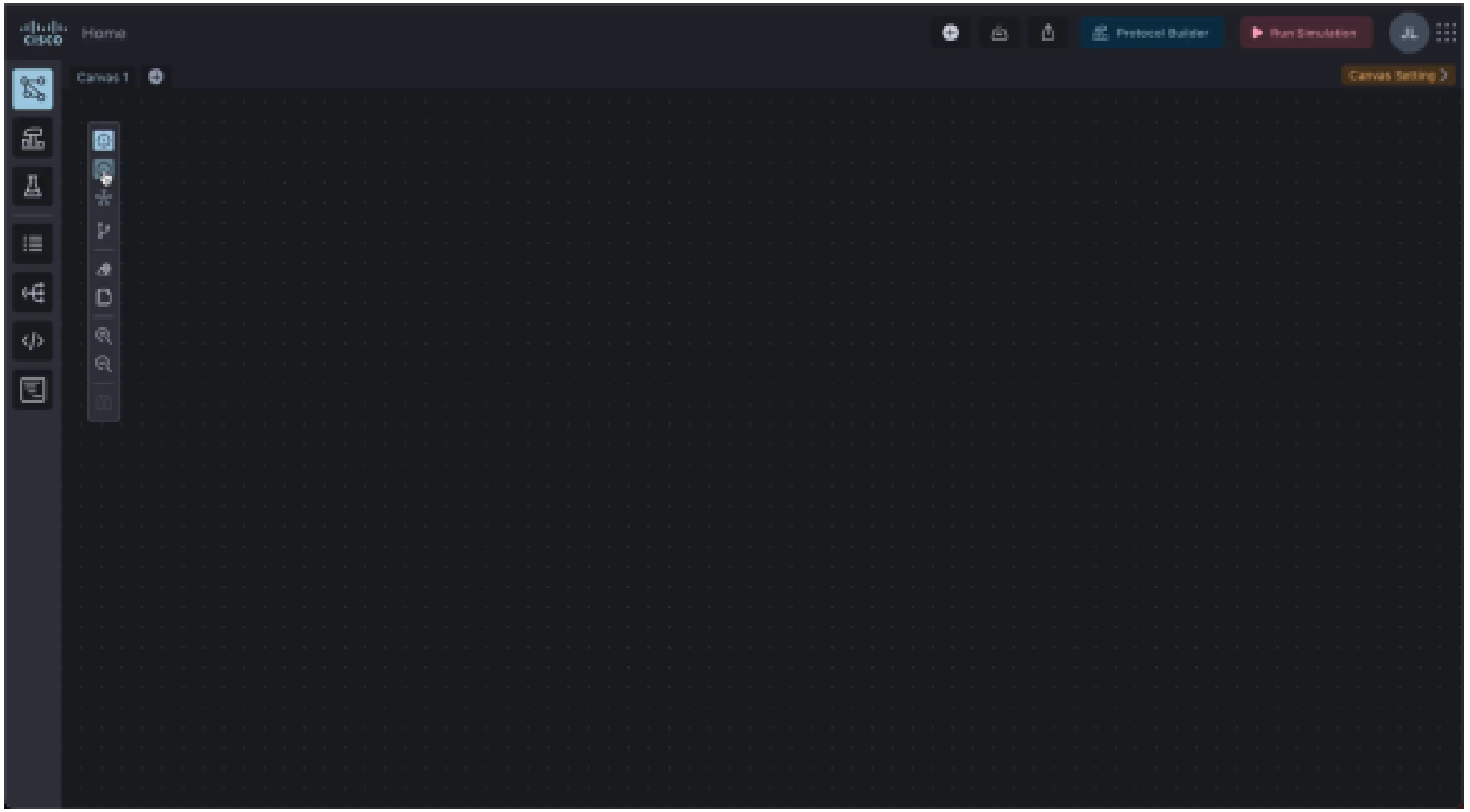
- Quantum photonics emerges as a promising platform for scalable quantum information processing
  - possibly at room temperature
- These directly enable quantum networking
  - by serving as a repeater for quantum error correction, or
  - as a server for distributed quantum computing resources





https://outshift.cisco.com/blog/how-powerful-are-photonic-quantum-processors

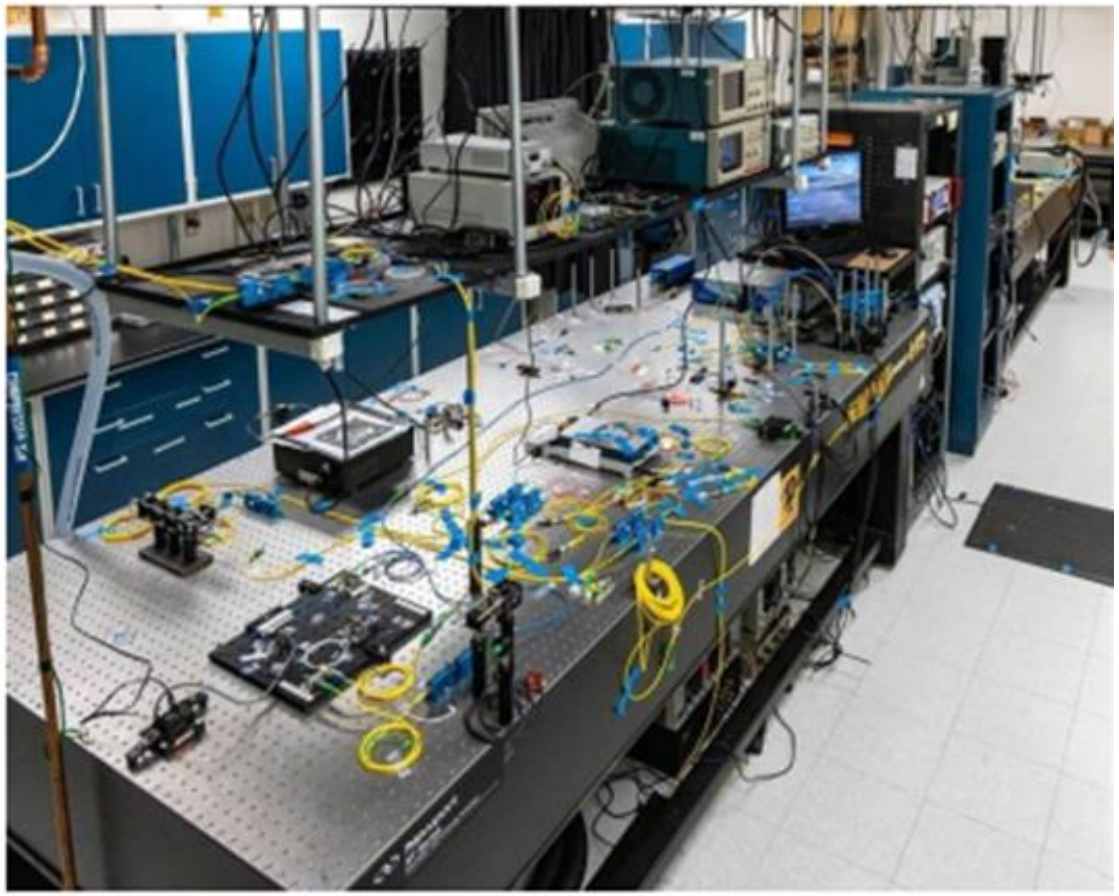
Quantum Network Design Kit (QDNK) Simulator



https://research.cisco.com/research-projects/qnet-lab

Cisco Quantum Research Lab

- Cisco announced the opening of a Quantum Research Lab in March 2023 in Santa Monica, CA




QUESTIONS
ANSWERS