Quantum Communication and Networks

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Quantum Communication, as of today, is entirely based on Bipartite Entanglement. While this ensures a uniformity in design, it also limits concurrency in communication. I would like to focus my effort on **Intra-domain networking**, and arrive at a practical implementation of **Multi-partite Entanglement-based Quantum Networking**.

Much of my effort will be focused on **Design**. Its briefly described below:

1. N/W stack layers
   (a) Physical
   (b) Connectivity
   (c) Link
   (d) N/W (Routing)
   (e) Services
   (f) Application
2. Responsibilities for each Layer
3. Protocols in each layer
4. Quantum Packet Design
   (a) Raw qubit (data)
   (b) Quantum (Layer) headers
5. Node architecture design

   (a) End-hosts
   (b) Intermediate routers/ switches

6. Quantum Resource Distribution Management (some of which are)
   (a) Quantum Entanglement generation capacity of every node
   (b) Node-wise N/W capacity utilisation data management
7. Quantum-enabled OS - for end-hosts and intermediate nodes.

For **Simulators**, QuTech has developed two types of Simulators: SimulaQron (for Upper layers), which is public and NetSquid (for Lower layers), which is not yet public. I probably will be using the former.

Expected **Timeline**:

1. Feb 2020: **Literature survey** of Classical networking topics and Quantum Networking topics
2. March 2020: Attempt **Preliminary design** of:
   (a) N/W stack, with a focus on Connectivity, Link and Network layer
   (b) Responsibilities of layers
   (c) Protocols
   (d) Packet design
   (e) Resource distribution and monitoring: Quantum and Classical
   (f) Design of nodes: end-hosts, routers, switches etc.
3. April 2020: Revise this design and compare w/ Classical N/W. Start Simulation.
4. May 2020: Simulation and Presentation.