The link layer service in a Quantum Internet

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Scope of the draft

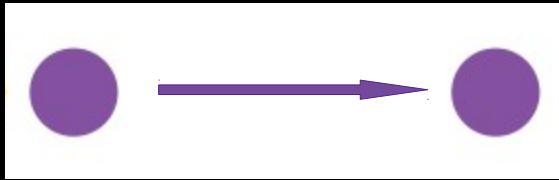Define service and interface of link layer.

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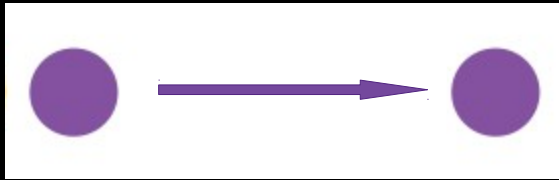
Protocol providing this service in paper online:

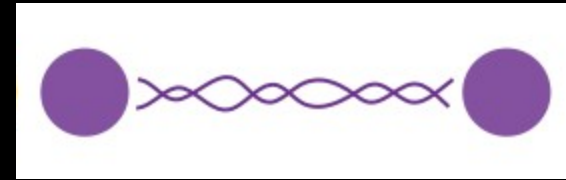arxiv.org/abs/1903.xxxxx

Classical vs Quantum
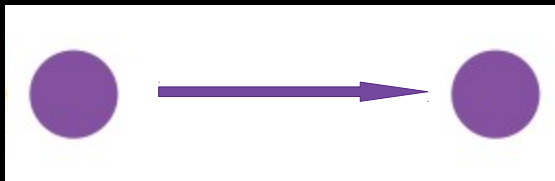

Send message

Classical vs Quantum

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Entanglement

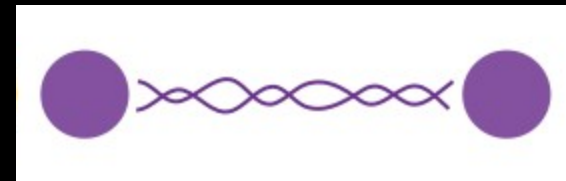# Classical vs Quantum

Send message
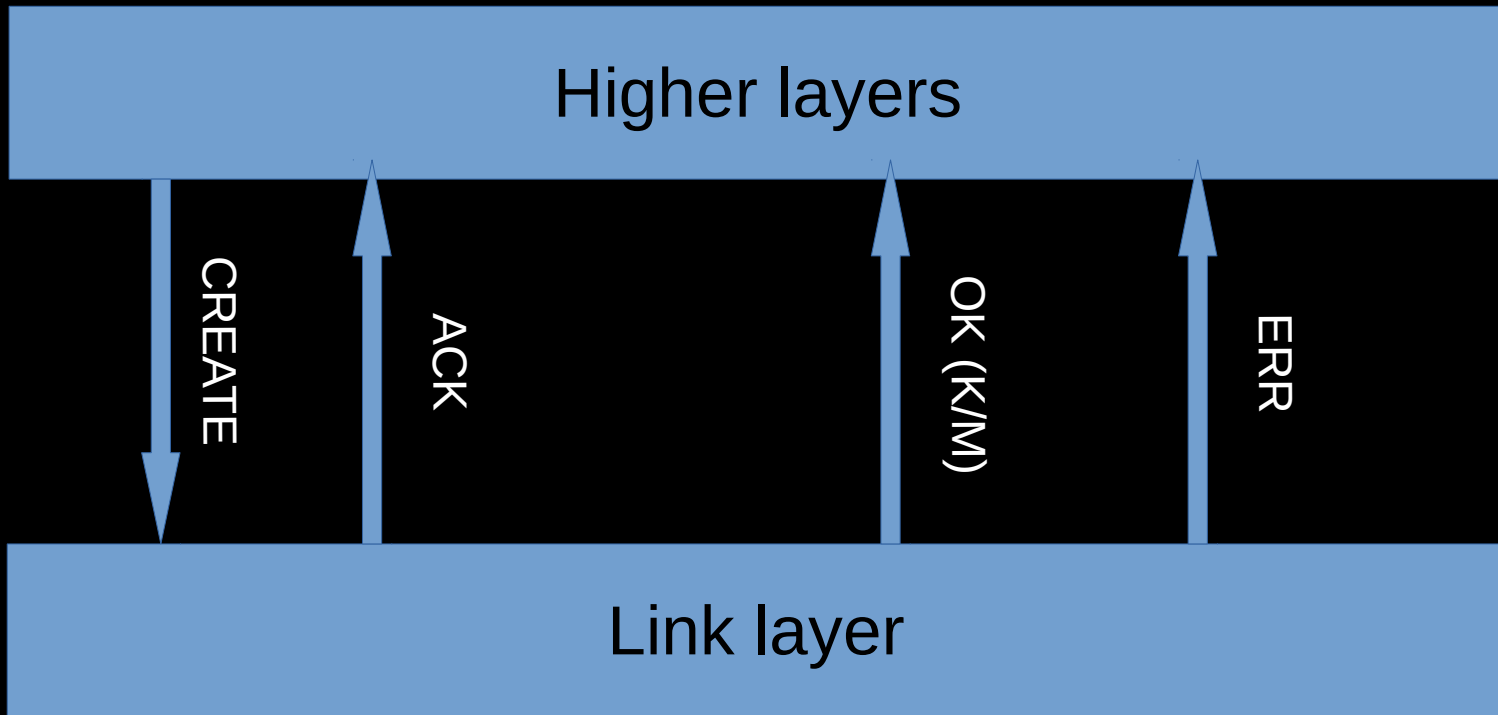
Entanglement

(a) Teleport — A, B

(b) Entanglement Swap — A, B, C

Interface

CREATE

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Remote Node ID                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Minimum Fidelity        |           Max Time            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Purpose ID           |            Number             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Prio    |T|A|C|                                               |
| rity    |P|T|O|                   Unused                      |
|         |E|O|N|                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Questions/Discussion

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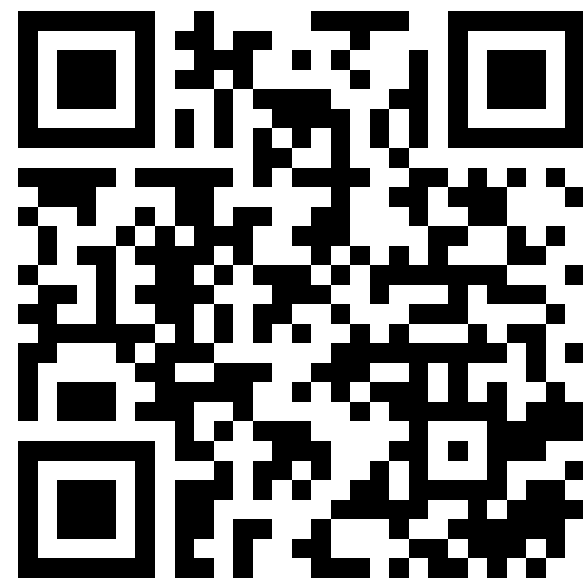- Feasability, limitations and restrictions?
- Continued work on draft?

Draft

draft-dahlberg-ll-quantum-00

Paper

arXiv:1903.xxxxx

Desired Service

A link layer between two nodes A and B of a quantum network must provide the following features:

- Allow both node A and B to initialize entanglement generation.
- Allow the initializing node to specify a desired minimum fidelity and maximum waiting time.
- Notify both nodes of success or failure of entanglement generation before the requested maximum waiting time has passed since the request was initialized.
- If success is notified, the generated entangled pair has with high confidence higher (or equal) fidelity than the desired minimum fidelity.
- For successful request, provide an entanglement identifier to allow higher layers to use identify the entangled pair in the network.