The link layer service in a Quantum Internet

draft-dahlberg-ll-quantum-00
datatracker.ietf.org/doc/draft-dahlberg-ll-quantum

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Scope of the draft

Define service and interface of link layer.

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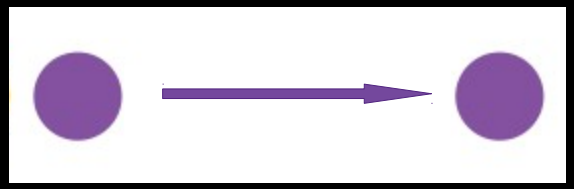
Protocol providing this service in paper online:

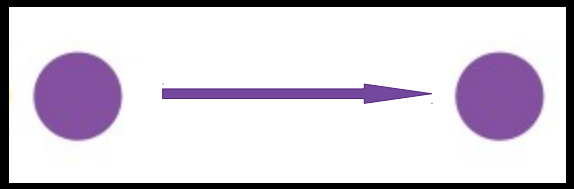
arxiv.org/abs/1903.09778

Classical vs Quantum



Send message

Classical vs Quantum



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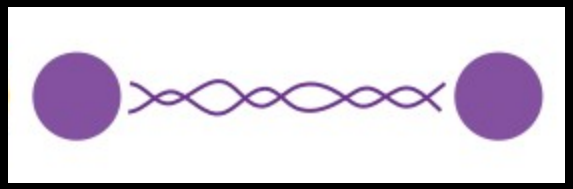
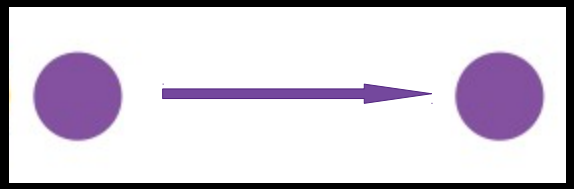


Entanglement

Classical vs Quantum



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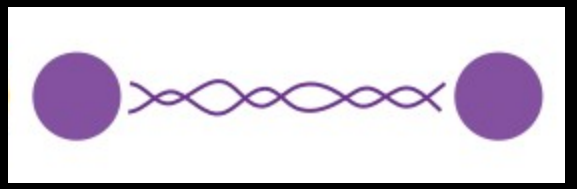
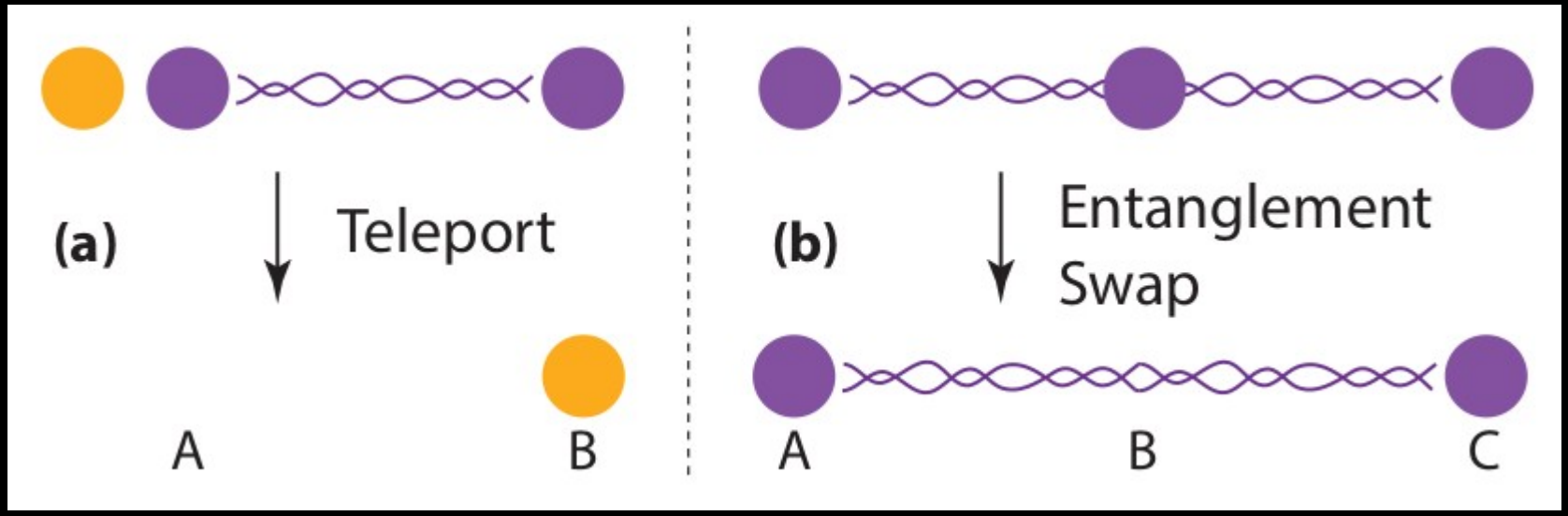
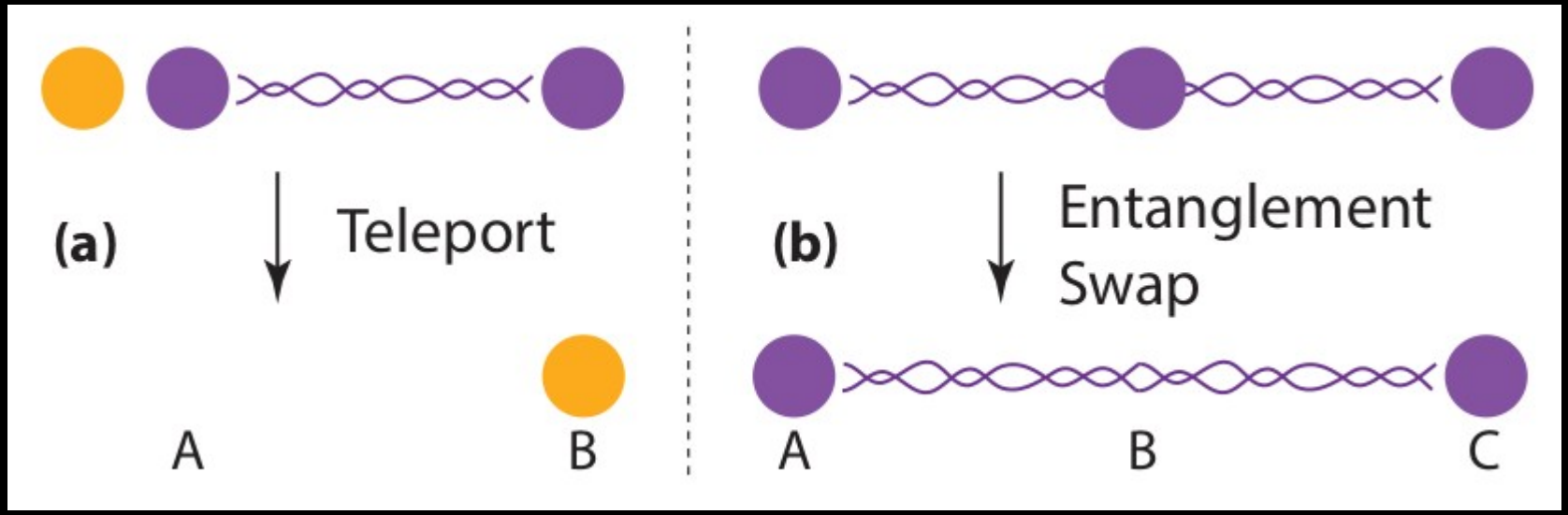


Entanglement

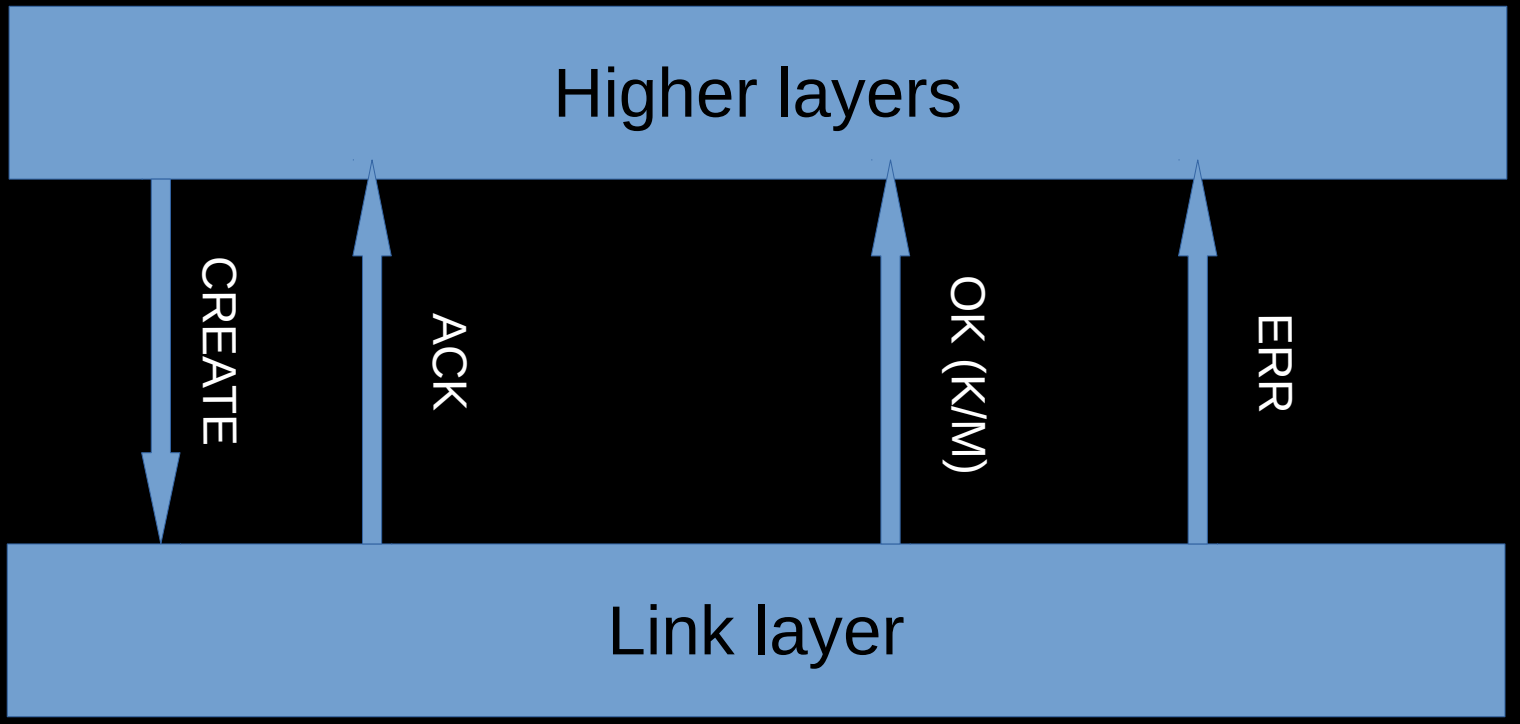


Classical vs Quantum

Application	
Transport	Qubit transmission
Network	Long distance entanglement
Link	Robust entanglement generation
Physical	Attempt entanglement generation



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

- Requirements from applications/higher layers?

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- Feasability, limitations and restrictions?

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

Draft

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Paper

arXiv:1903.09778

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.