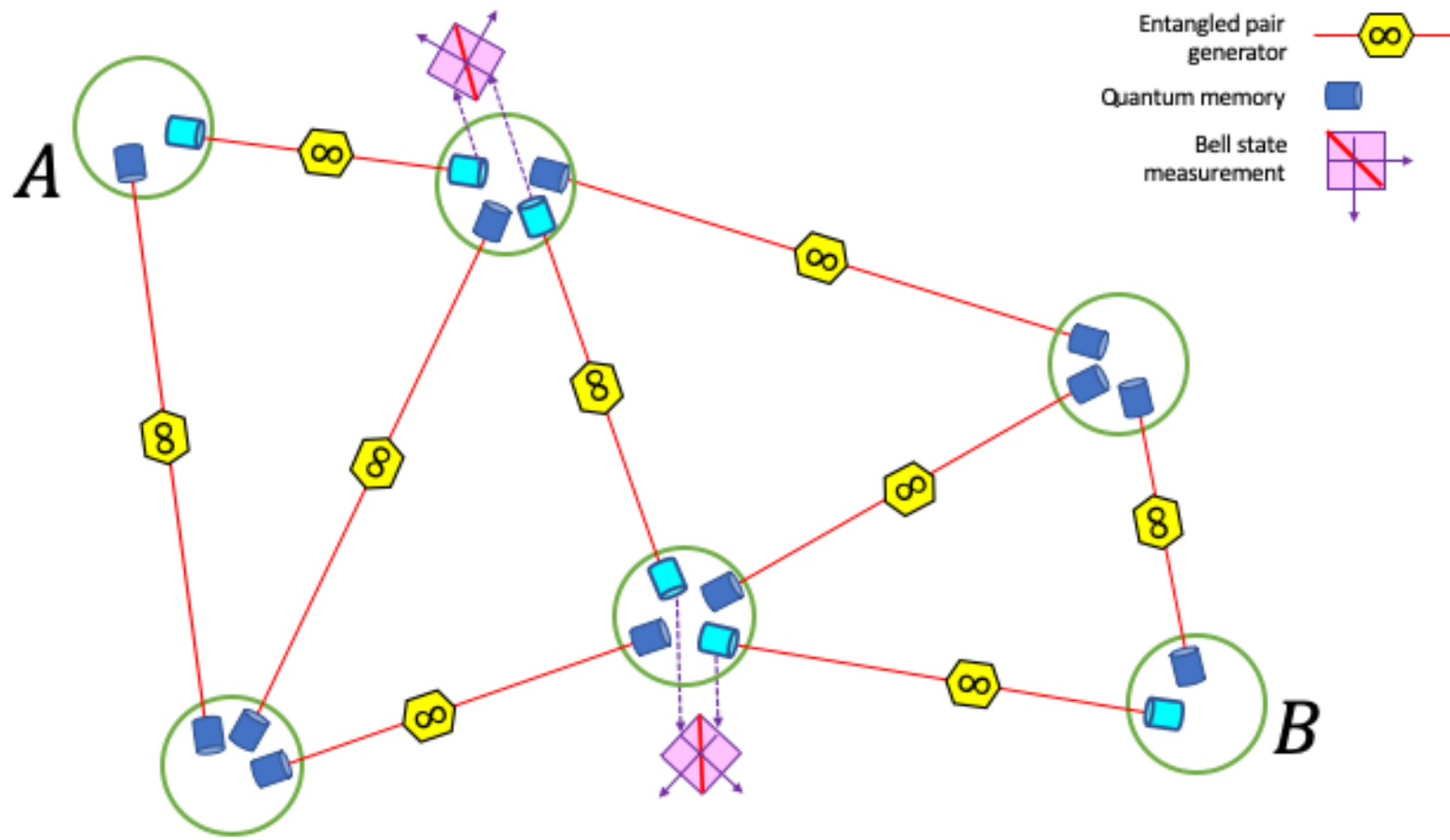
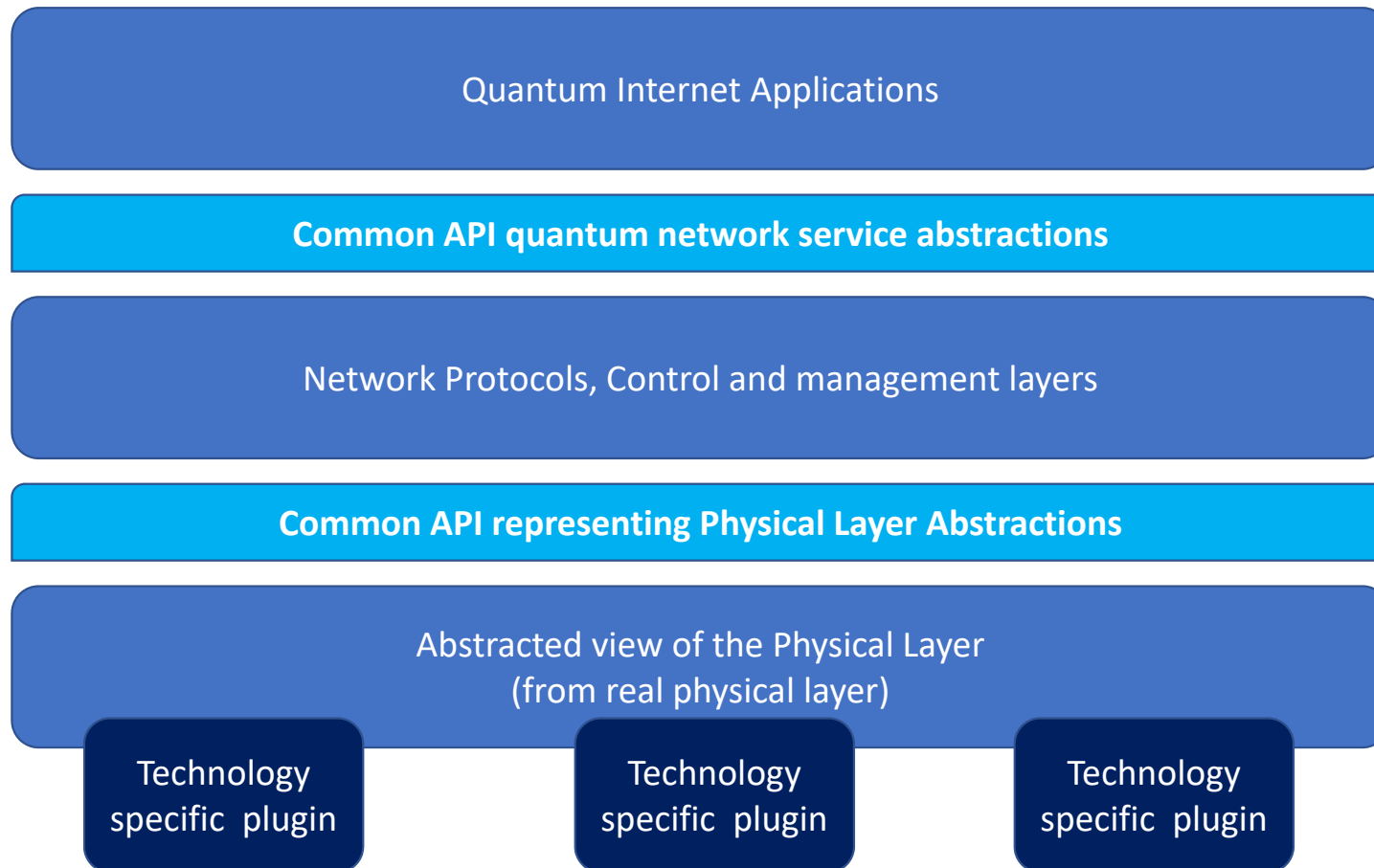


Quantum switches and routing for more complex topologies



Simulation architecture and abstracting complexity – iterative refinement of the three layers



Resource Requirements - Capability

- Quantum Node
 - Number of racks
 - Power density
- Physical Medium
 - Fiber
 - Type? Characteristics?
 - SDM will be useful for quantum internet applications
 - Free-space
 - Satellite
 - May be needed to go to 17 labs
- Classical Network
 - Parallel fiber?, in-band but frequency separated, etc?
 - Parallel fibers to start with
 - Coexist on the same fiber – what is the interference ? Power? Non-linearities?
 - Tradeoffs studied, classical network to provide control.
 - Classical data overhead is massive, FPGAs to process, etc.
 - Latency is very important – dedicated channels are a requirement.
 - Channel for timing, dedicated control channel – may need coexistence
 - Huge bandwidth requirements on the classical network
- Access requirements
 - From grad students to remote control/instrumentation

Requirements on timing

- Timing and synchronization– good to detector resolution
 - 10 picosecond level
 - Borrow from HEP/LHC
- 2 picosecond current state of art in clock recovery
- Phase stabilization
- NIST – benefit...to classical side.
 - Two way time transfer?

Resource Requirements - Effort

- Approx size of each cohort?
- Coordination between teams?

Architectural design of quantum networks

- Close collaboration with experimenter groups
- Investment in a open, common simulation platform
- Agree on how we support, test, validate, and add to it – governance

Incubation and integrative testbed

- Design the classical network control and management
- Federated testbed
 - Communicated control plane....

Timeline

- From Nick Peters slide yesterday
- Other views of the timeline?
 - Project view?
 - Testbed view?

Impact on Classical Networking

- One fiber or one wavelength
- Synchronization between the two networks
- What new services are needed in classical networks to support this?
 - Timing?
- Reliability of Quantum links / troubleshooting techniques

Resource Requirements - Effort

- Approx size of each cohort?
- Coordination between teams?