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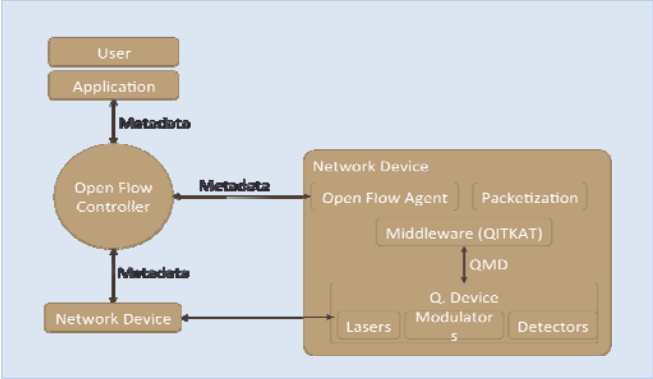
Quantum Metadata Networking

S&T Campaign: Computational Sciences
Advanced Computing Architecture

Venkat Dasari, (410) 278-2846
venkateswara.r.dasari.ctr@mail.mil

Research Objective

- **Development of SDN based communication channel for quantum metadata transport for Interconnecting Quantum Nodes and Sensors**
- **So far no standard classical communication channel is defined to carry metadata between quantum devices**
- **The proposed SDN classical channel will act like a bridge between the quantum and classical network layers.**

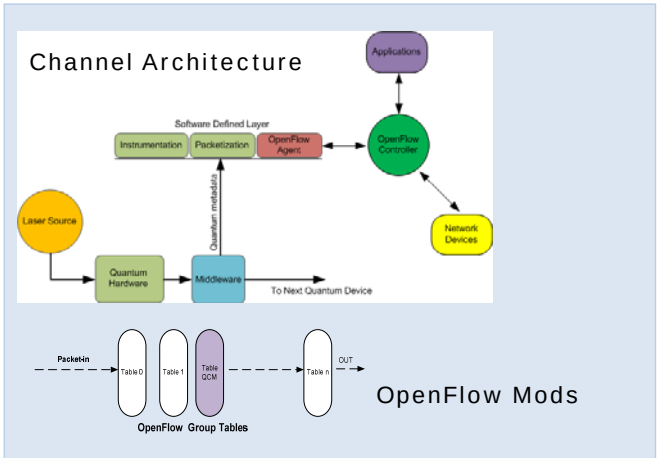


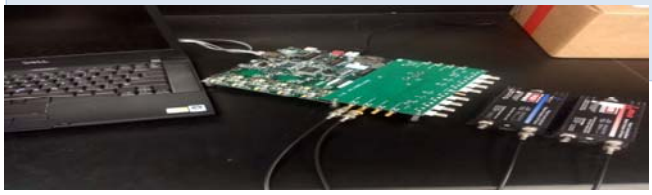
Proposed quantum metadata channel

Challenges

- **Quantum metadata channel must be agnostic to Quantum Network Device Types**
- **Need for a unified control channel for quantum network communications**

Approach



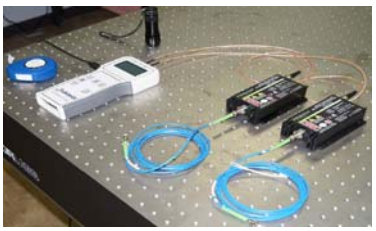


FPGA Middleware

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Center for Distributed Quantum Information (CDQI)**
- **ARL has Large Array of Supercomputers for simulation and Testing of the proposed Metadata Network Models**
- **ARL is building an Engagement Lab to generate Quantum Metadata for supporting this Research effort**
- **ARL Researchers have already identified and modified OpenFlow attributes to support Quantum Metadata Network Communications**
- **Provide full references of related patents and peer-reviewed journal articles…**
- **Proposed network communication has been simulated using Python framework**

HPC Systems



Entanglement Lab

Metadata Channel

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Strong theoretical and experiment research experience in Quantum Network Architectures & protocols**
- **Facilities to create Entanglements and to generate Metadata for transport on classical Channel**
- **Expertise in Quantum Sensor Networking**
- **Strong background in programmable networking to encode Quantum metadata into OpenFlow attributes**

Publications & Recognition

- T. S. Humble, R. J. Sadlier, B. P. Williams, K. A. Britt, V. Dasari, and V. Mishra, "Software-defined Quantum Networking², Workshop for Quantum Repeaters and Networks (2015)
- T. S. Humble and R. J. Sadlier "Software-defined Quantum Communication Systems", Optical Engineering 53, 086103 (2014) 3. T. S. Humble, "Quantum Security for the Physical Layer," IEEE COMSOC Magazine 51, 56 (August, 2013)
- *Dasari, & Humble. Software Defined Network based Optical Network Channel for Quantum Communication(**Manuscript getting ready for publication)***

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