

AirolNet™ Data Sheet

AirolNet™ is an efficient solution for realizing novel end-to-end entanglement distribution quantum networks. This unified solution is used to emulate hardware and networks, implement small scale pilots, and deploy full-scale universal entanglement-based quantum networks.

Constructing an operational quantum network is difficult, resource-intensive, and time-consuming because it is an intrinsically complex and interdisciplinary endeavor. Deep technical expertise from many different highly specialized fields is required to construct and operate these networks.

AirolNet™

AirolNet™ empowers organizations to wisely navigate the process of designing, piloting, and deploying a multipurpose entanglement based quantum network. This is accomplished in three modes via a comprehensive suite of technical support services, Airol Simulator, Airol Visualizer, Airol Orchestrator, Airol Controller, and AirolOS™.

Use Cases

Design and Emulation of Quantum Networks

Plan with a data driven, optimized, and realistic vision.

- Assess what is required in a quantum network implementation to meet specific requirements
- Create realistic performance estimates for concrete network design drafts
- Make informed decisions about trade-offs in cost, performance, and node placement
- Evaluate the performance and interoperability of competing hardware modalities and devices before purchasing
- Discern which use cases are practically viable on a planned network implementation
- Develop, test, and benchmark protocols and applications before purchasing a single piece of hardware

Quantum Network Pilot Implementation

Quickly build an on-site functional quantum network testbed.

- Test interoperability between quantum networking devices, optical components, existing infrastructure, firmware, and software
- Build internal expertise with the technology
- Showcase the state of the art
- Demonstrate a concrete proof of concept enabling resource allocation for scale deployment

Full-Scale Quantum Network Deployment

Deploy a geographically dispersed end-to-end quantum network.

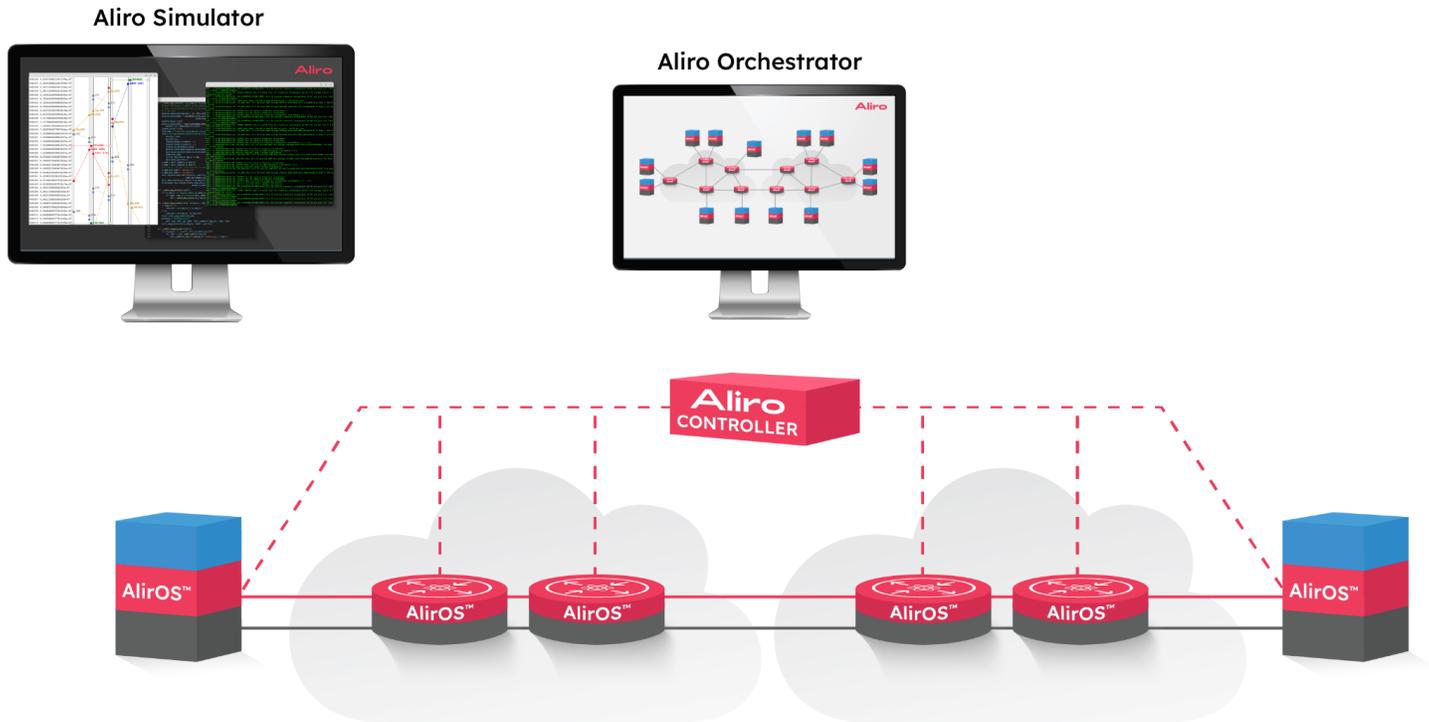
- Deploy and scale an operational entanglement-based quantum network
- Support transformative applications in secure communications, clustered quantum computing, and distributed quantum sensing
- With an AirolNet™ multipurpose, hardware agnostic approach, avoid getting locked into specific vendors, modalities, or use cases
- Continually evolve as more sophisticated hardware, protocols, and applications arise

Features

AliroNet™ operates in three modes, each containing a set of features and capabilities in addition to professional services. Together, these enable your organization to efficiently reach the targets set for each mode.

	Emulation Mode	Pilot Mode	Deployment Mode
Aliro Simulator	✓	✓	✓
Network Design Support	✓	✓	✓
Hardware Acquisition Support		✓	✓
Pilot Implementation Support		✓	✓
Aliro Orchestrator		✓	✓
AlirOS™		✓	✓
Aliro Controller		✓	✓
Pilot Operation Support		✓	✓
Scaling Support			✓
Operational Network Support			✓

Software Components



Aliro Simulator

Aliro Simulator is a versatile, modular, insight generating quantum network simulator equipped to model the smallest optical components up to large heterogeneous networks with extreme physical accuracy.

- Ultra high time resolution via the use of discrete event simulation
- Realistic error modeling
- Extensive library of components and abstractions
- Modular design with full support for creating new user-specific models and components
- Efficient and flexible state representations allow for scaling from single-photon experiments to large networks
- Full control over protocol design
- Visualizer tool for generating diagrams that allow users to graphically investigate the node level performance of a network design and set of protocols

The visualizer tool is vital for protocol development as well as debugging. It is implemented as a standalone application that reads in network logs, so it can visualize not only simulated performance, but also real performance data from physical hardware.

AlirOS™

AlirOS™ is the software stack that runs on the end-nodes and repeaters. AlirOS™ continues to evolve with the hardware it runs on, from controlling individual hardware components to executing adaptive protocols.

- Control a variety of heterogeneous hardware devices from different vendors
- Transport photonic data
- Execute swapping and purification protocols
- Create quantum connections on demand
- Support execution of quantum applications
- Defined using a layered model similar to the OSI reference model

Aliro Controller

Aliro Controller serves as a centralized brain for the quantum networking stack, controlling all instances of AlirOS™.

- Network path identification and configuration
- Monitors status of all network components
- Quantum connection setup and management

Network Design Support

- Initial assessment consultation
- Assisted prototyping, design assessment and optimization
- User, technical, use-case, and logistics support
- Ongoing software enhancements
- Customized simulation features

Hardware Acquisition Support

- Analysis, selection, and acquisition of third party quantum networking hardware

Pilot Implementation Support

- On-premises implementation
- Interoperability testing and integration, debugging, and calibration
- Hardware calibration
- Software debugging
- Joint publication

Aliro Orchestrator

Aliro Orchestrator manages the entire life cycle of a quantum network and provides a unified, intuitive application through which network operators can see everything, control everything, and leverage automated network operations.

- Model-View-Controller application for setup, configuration, management, control, and monitoring
- Interactive visual user interface
- Natively drives Aliro Controller and AlirOS™, but can also be used with any configuration of third party controller and/or control software running on third party hardware components.

Pilot Operation Support

- Orchestration support
- Network characterization and performance examination
- Maintenance support

Scaling Support

- Tailored upgrades to Aliro Simulator, AlirOS™, Aliro Controller, and Aliro Orchestrator to support full-scale deployment
- Large scale acquisition of third party quantum networking hardware
- Integration, debugging, and calibration

Operational Network Support

- Ongoing software upgrades, including customized features to support the ongoing operations of the deployed network
- Application support to effectively utilize the full potential of your network
- Maintenance support