



# Design and Implementation of a Three-Node QKD Communication Framework – Project & Thesis Topics for Students

## 1. Project Background

Quantum Key Distribution (QKD) is a core technology in the field of quantum communication, enabling theoretically unconditionally secure key distribution. With the rapid development of quantum communication technologies, the design and implementation of QKD systems have become a research hotspot. This project aims to design and implement a three-node QKD communication framework and develop a fully functional frontend UI for monitoring network status, deploying tasks, and managing quantum keys.

## 2. Project Objectives

- Design and implement a three-node QKD communication framework supporting quantum key distribution and classical network communication.
- Develop a frontend UI with the following functionalities:
  - Monitor network parameters (e.g., node status, key generation rate, communication latency).
  - Deploy tasks (e.g., QKD behavior between two nodes, quantum key-encrypted communication behavior).

## 3. Research Content

- Design a three-node QKD communication framework, defining node roles and communication protocols.
- Implement communication protocols between nodes to support key distribution and state synchronization.
- Design and implement a frontend UI with the following functionalities:
  - Real-time monitoring of network parameters and status.
  - Task deployment (e.g., QKD behavior, quantum key-encrypted communication behavior).
- Investigate the application of distributed features (e.g., fault tolerance, load balancing) in QKD systems.
- Validate the system's functionality and performance through simulation or experimentation.

## 4. Requirements for Applicants

1. Academic Background: Major in Computer Science, Electronic Engineering, Communication Engineering, or related fields.

2. Technical Skills:

- Familiarity with network communication protocols (e.g., TCP/IP, HTTP) and distributed systems.
- Experience in frontend development (e.g., React.js, Vue.js) is beneficial.

## Contact

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\*Outstanding research results may be published in relevant academic journals or conferences.