# Design and Implementation of a Distributed Quantum Key Management System for Three-Node QKD Systems
## – 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. However, with the rapid development of QKD technologies, quantum key management has become a critical research topic, especially in multi-node networks where key management faces challenges distinct from those in classical communication systems. This project aims to design and implement a distributed quantum key management system for three-node QKD systems, providing technical support for the future construction of quantum communication networks.

## 2. Project Objectives

- Investigate the challenges and existing solutions in quantum key management systems.
- Design and implement a distributed quantum key management system for three-node QKD systems.
- Address core issues such as key distribution, storage, updating, and security.
- Validate the system's functionality and performance through simulation or experimentation.

## 3. Research Content

1. Challenges and Existing Solutions in Quantum Key Management Systems:
   - Study the core issues in quantum key generation, distribution, storage, and updating.
   - Analyze the strengths and weaknesses of existing QKD key management solutions.
2. Design of a Distributed Quantum Key Management System:
   - Design the key management architecture for three-node QKD systems.
   - Implement efficient key distribution and relaying mechanisms.
   - Design secure key storage and updating schemes.
3. Security Assurance:
   - Research quantum-resistant key management protocols.
   - Implement security measures for key transmission and storage.
4. System Implementation and Testing:
   - Implement the distributed quantum key management system.
   - 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.
   - Proficiency in programming (e.g., Python, C++, Java).
   - Database related knowledge is preferred.
   - Experience in distributed systems or key management is a plus.
3. Attitude:
   - Proactive, with strong learning ability and teamwork spirit.

# Contact

yingjian.wang@tu-dresden.de
yilun.hai@tu-dresden.de

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