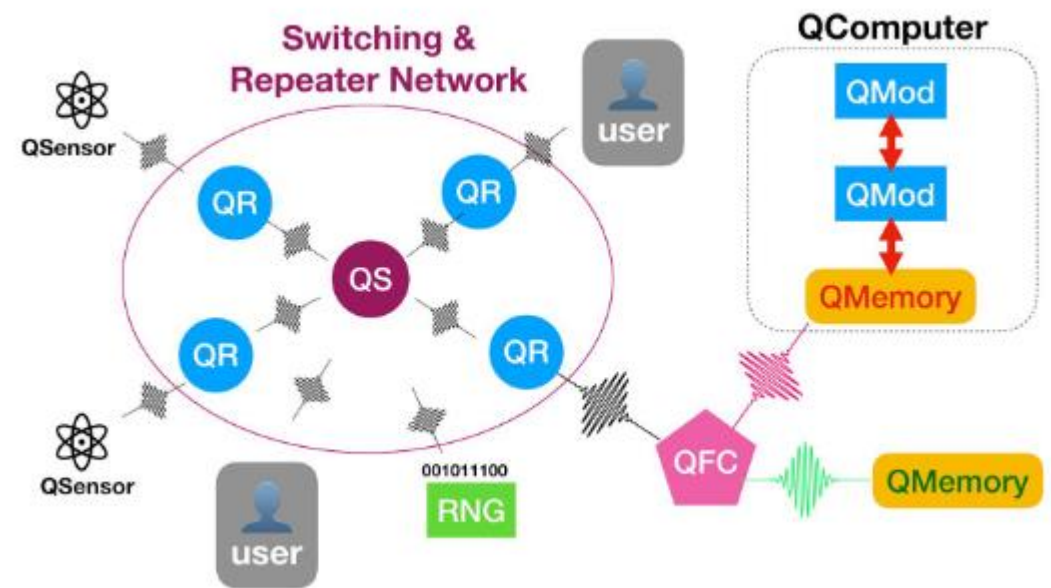


# บทที่ 2 WHY BUILD QUANTUM NETWORKS?

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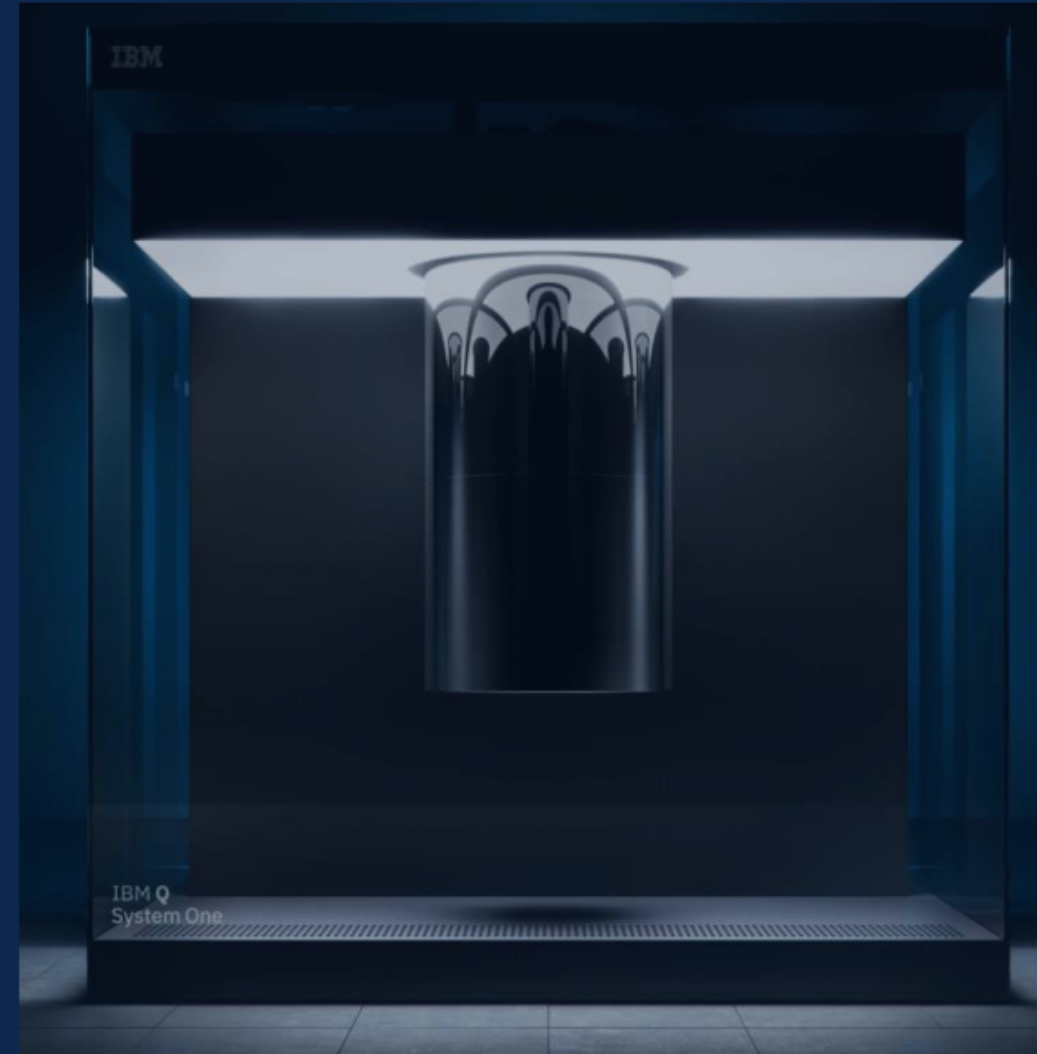
# Quantum Cryptography

- Quantum networks can be used to securely exchange cryptographic keys, as these are mathematically proven to detect and prevent eavesdropping
- The most well-known method of this application is *Quantum Key Distribution (QKD)*



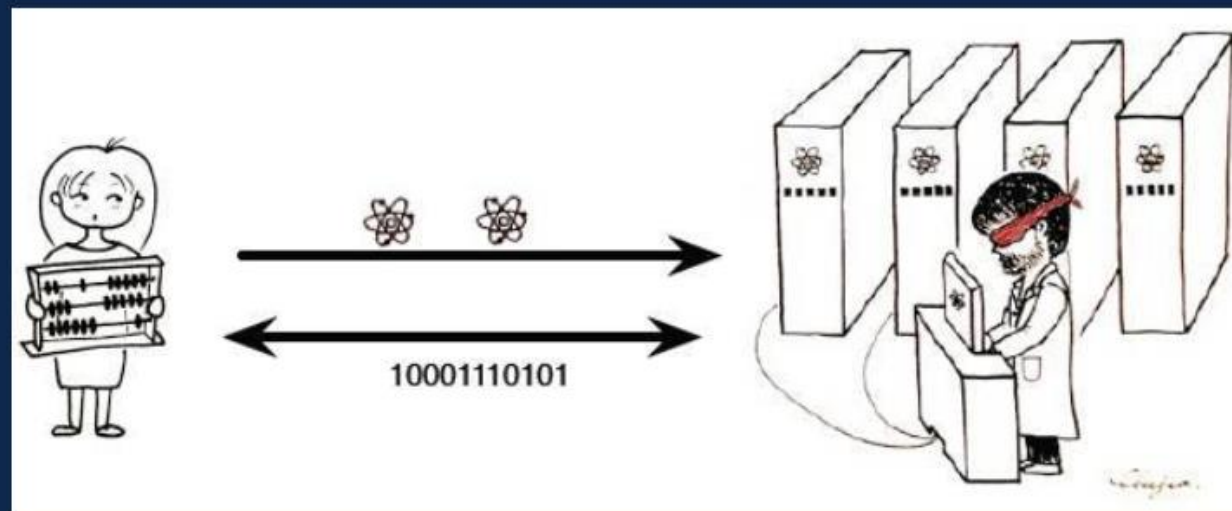
# Distributed Quantum Computing

- Interconnecting geographically-dispersed quantum computers to realize benefits such as:
  - Increased Processing Power
  - Distributed Quantum Computing
  - Specialized Quantum Modules
  - Fault Tolerance
  - Hybrid Quantum-Classical Systems
  - Etc.



# Blind Quantum Computing

- A privacy-preserving method in which a client can delegate a computation task to remote quantum computer(s) without disclosing the source data or algorithms
- The results of the computations would likewise be private



# Network Clock Synchronization

- A world-wide set of high-precision clocks connected by quantum networks could achieve ultra precise clock signals
- Current accuracy:  $\leq 30$  ns
- Quantum accuracy:  $\leq 1$  ps



<https://www.gps.gov/systems/gps/performance/accuracy/>  
<https://ieeexplore.ieee.org/document/9856607>

# Distributed Sensing

- Signals from distributed sensors can be combined via quantum networks to obtain higher-accuracy measurements than currently possible with classical network interconnections
- E.g. Deep Space Telescope Array
  - Classical precision:  $\pm 1/\sqrt{N}$
  - Quantum precision:  $\pm 1/N$



# Quantum Money

- The main security requirement of money is unforgeability
- A quantum money scheme aims to fulfill by this requirement by exploiting the no-cloning property of the unknown quantum states



