



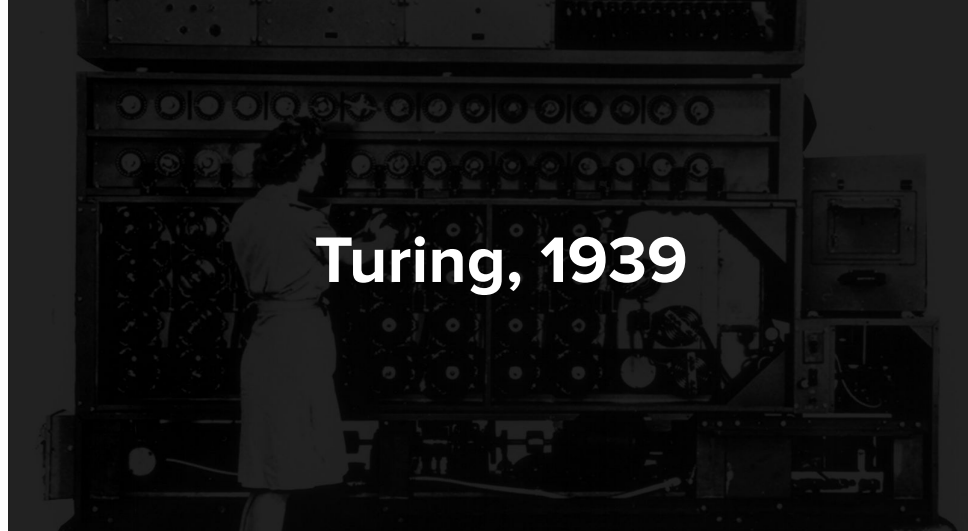
Quantum IoT and Security: A Quantum Internet

TD Tech Connect 2020 Conference | Alice Liu

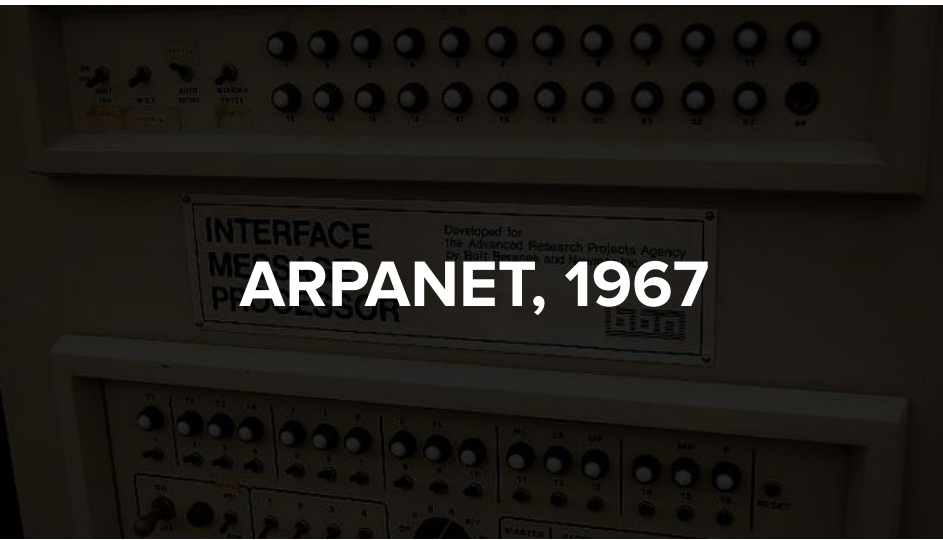




Maskelyne, 1903



Turing, 1939



ARPANET, 1967

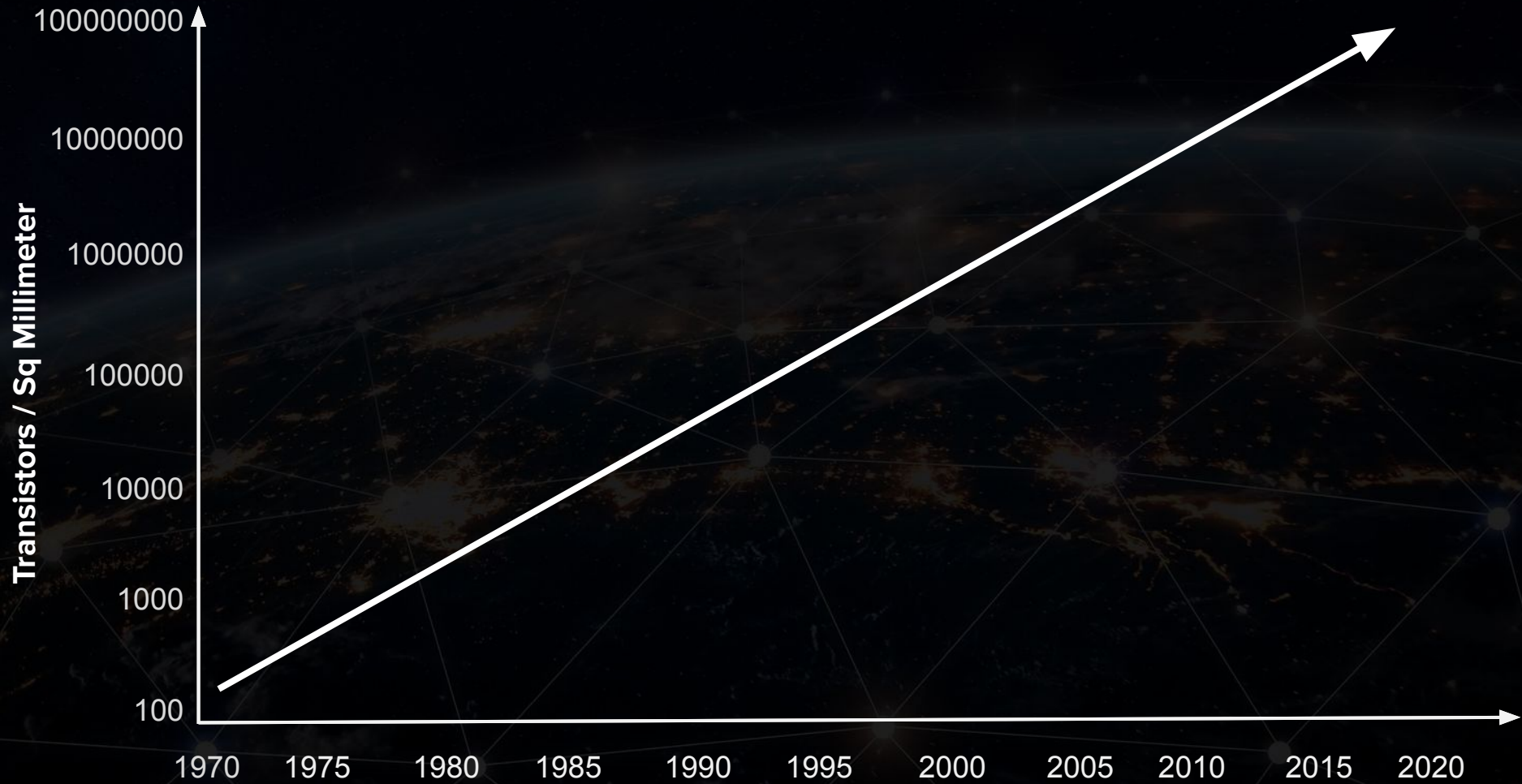


Yahoo! 2016

A world map with a dark blue background. Numerous red and blue circles of varying sizes are scattered across the map, representing botnet activity. The red circles are larger and more numerous, particularly in North America, Europe, and East Asia. The blue circles are smaller and more sparsely distributed. The text '80,000 Attacks / Day' is centered over the map in white. A legend at the bottom right explains the symbols: a red circle for 'Locations with the most intense bot activity' and a blue circle for 'Command & Control botnet servers'.

80,000 Attacks / Day

- Locations with the most intense bot activity
- Command & Control botnet servers





Healthcare



Public Sector



Finance



270 million



-\$6,000,000

HIPAA's Health Data Breaches





**Quantum
Properties**

x



**Internet of
Things**



**Internet of
Things**

=

**Network Data
Transfer**

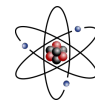
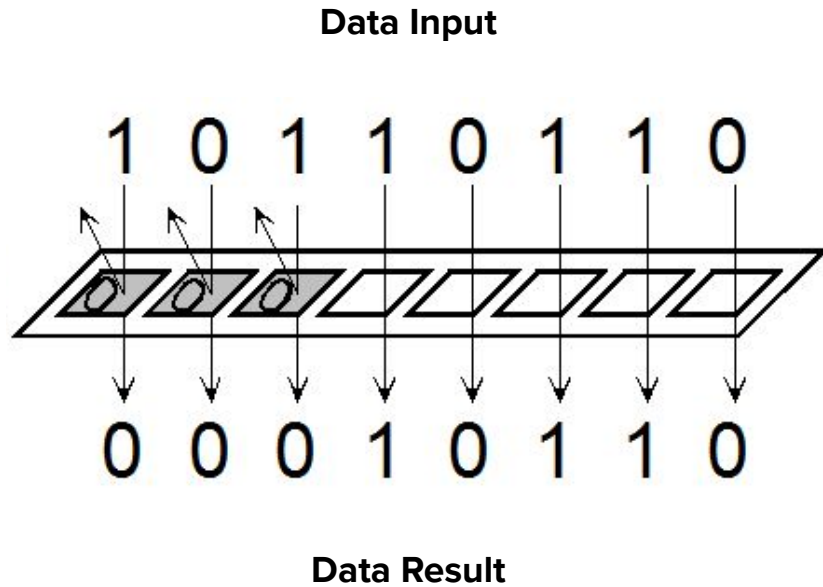
A complex quantum optics experiment setup, likely a quantum communication or quantum computing system. It features a dense network of fiber optic cables, optical components, and a central processing unit. The setup is illuminated with a warm, golden light, creating a futuristic and technical atmosphere. The background is dark, making the illuminated components stand out.

**Quantum
Properties**

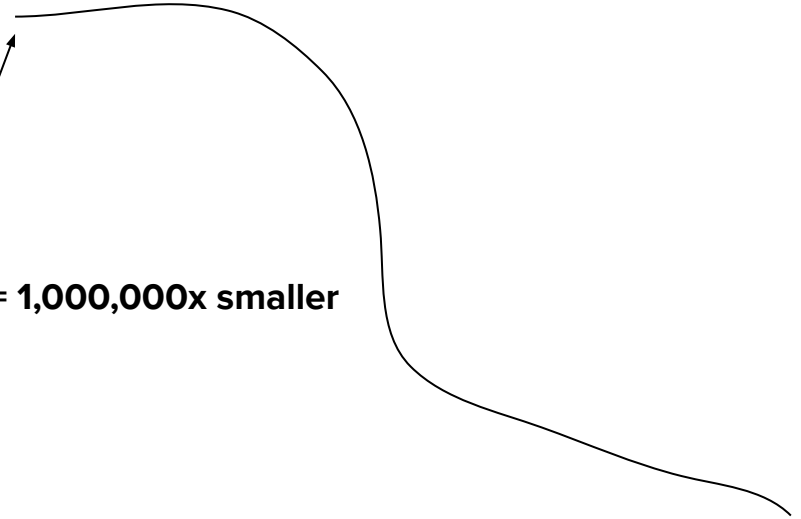
=

QKD

The Atomic Scale



= 1,000,000x smaller



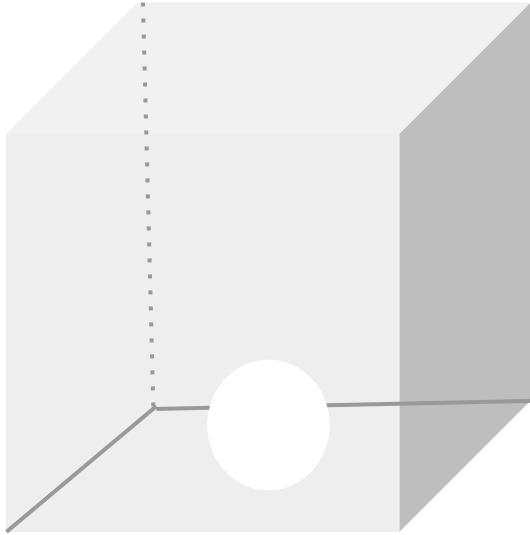


**“Spooky action at a distance”
- Einstein**

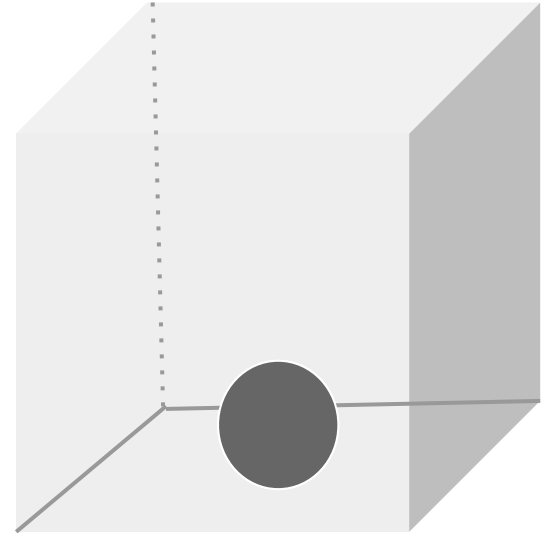
Quantum Entanglement



Box 1



Box 2



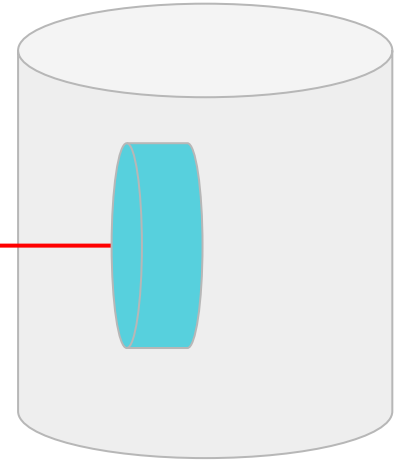
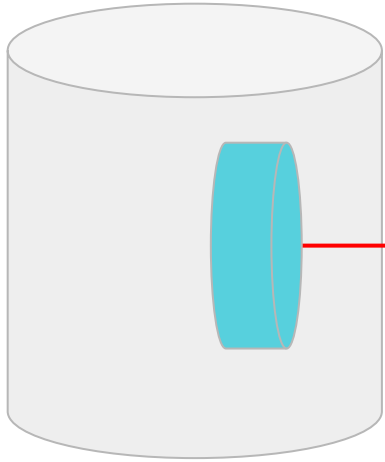
distance = x



Alice

Quantum Key Distribution

Bob



Alice's Sequence	1	1	1	0	0	1
Bob's Bases	+	+	x	x	+	x
Bob's Result	0	1	0	-	0	1
Result	-	1	-	-	0	1



**Entanglement
Lake Reflection Connection**

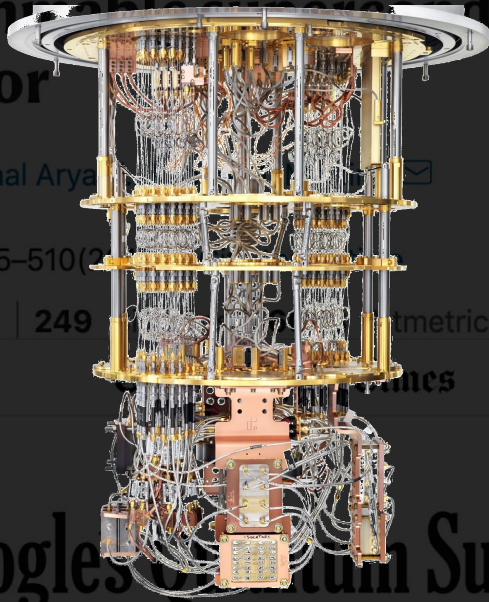
Article | Published: 23 October 2019

Quantum supremacy using a programmable superconducting processor

Frank Arute, Kunal Arya

Nature 574, 505–510(2019)

744k Accesses | 249



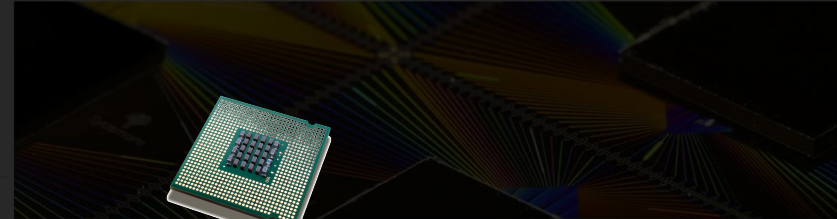
GOOGLE | SCIENCE | TECH

Google confirms 'quantum supremacy' breakthrough

Its research paper is now available to read in its entirety

By Jon Porter | @JonPorty | Oct 23, 2019, 6:31am EDT

f t SHARE



It's official: Google has achieved quantum supremacy

f t w in r e

PHYSICS 23 October 2019

Opinion

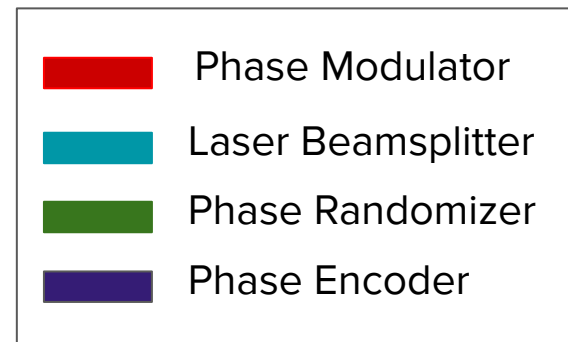
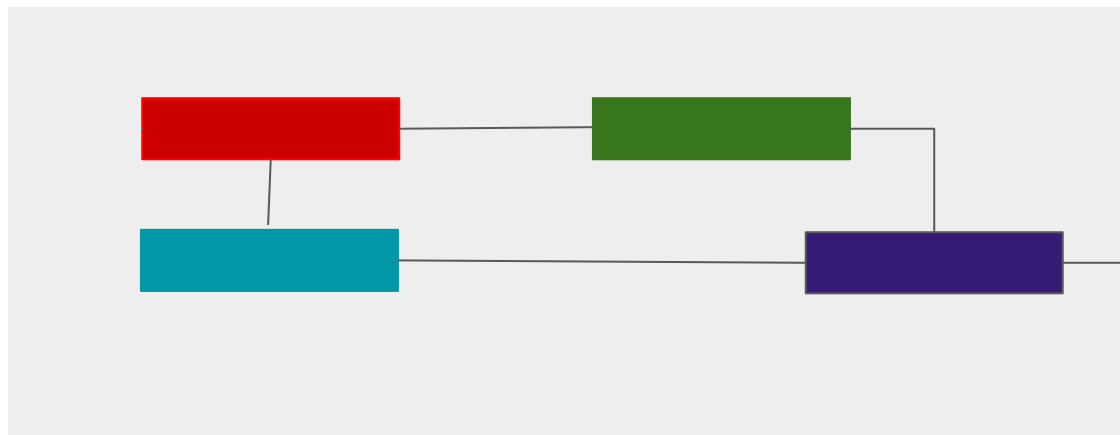
Why Google's Quantum Supremacy Milestone Matters

The company says its quantum computer can complete a calculation much faster than a supercomputer. What does that mean?

Harvard Quantum Initiative Co-Director Lukin on 'quantum supremacy' and Google's announcement of its achievement

Transmitter Chip

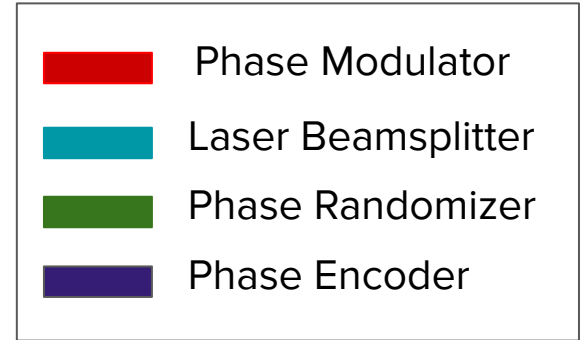
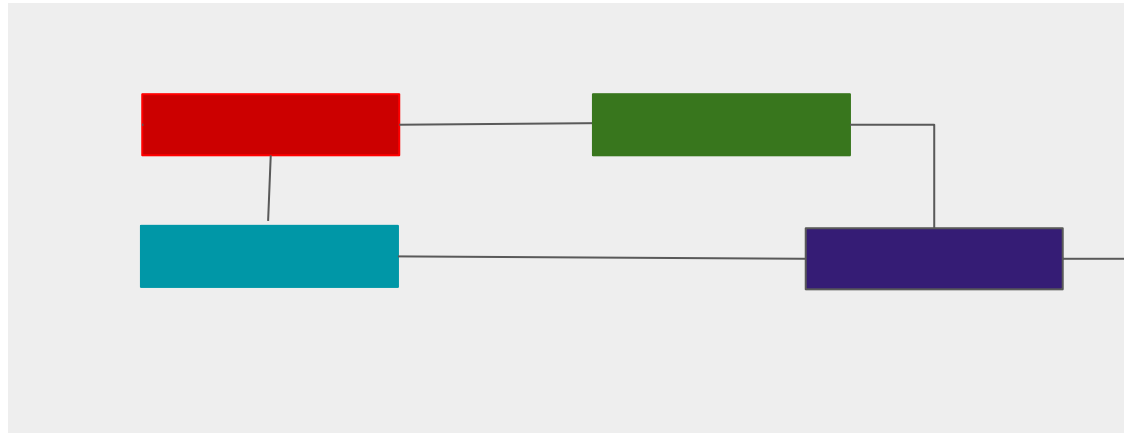
T =




QKD Transmission

Transmitter Chip

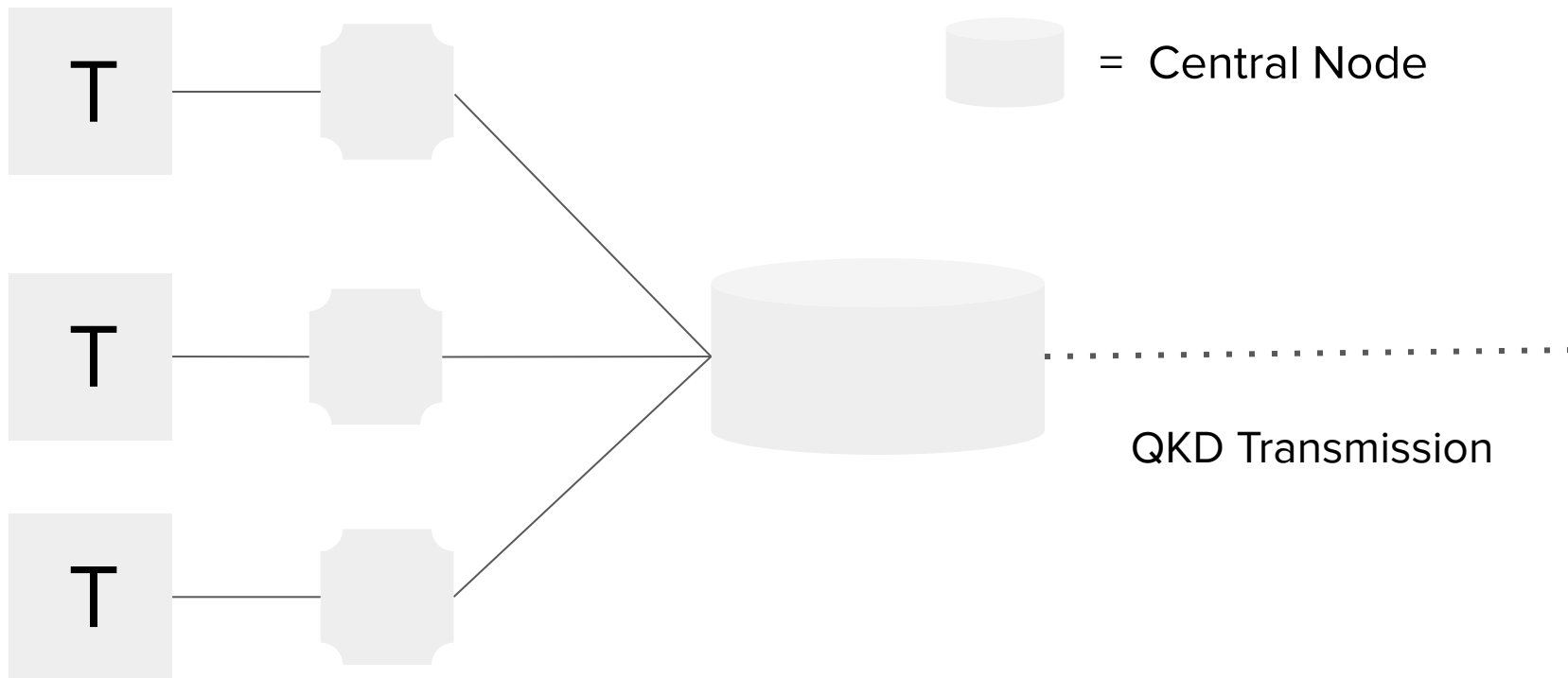
T =



QKD Transmission

 = IoT Device

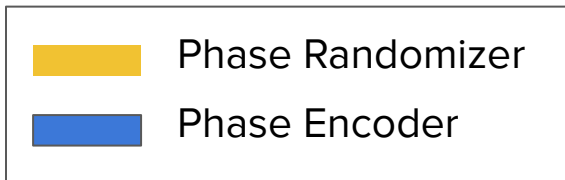
 = Central Node



Receiver Chip

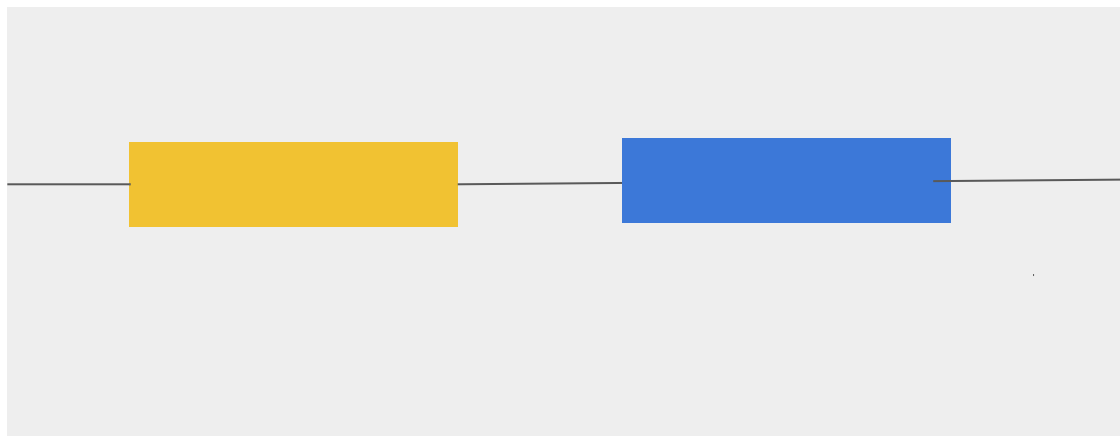
R

=



.....

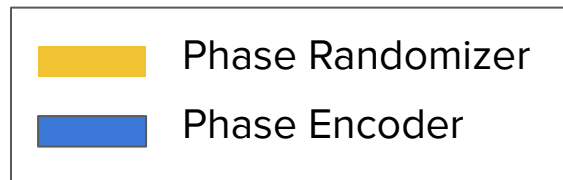
QKD Transmission



Receiver Chip

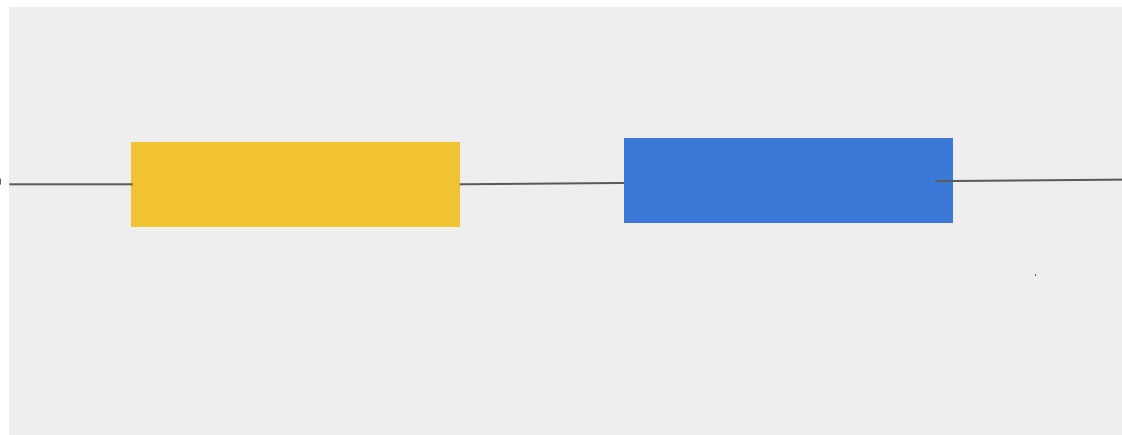
R

=



.....

QKD Transmission



Transmitter Chip

T =

- Phase Modulator
- Laser Beamsplitter
- Phase Randomizer
- Phase Encoder

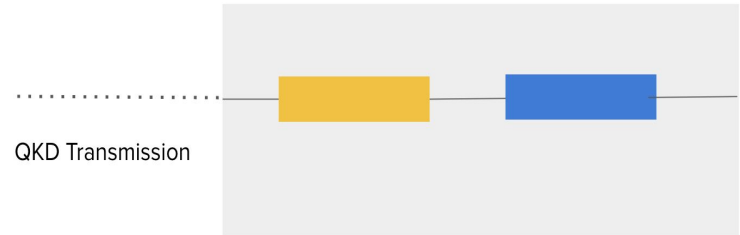


QKD Transmission

Receiver Chip

R =

- Phase Randomizer
- Phase Encoder



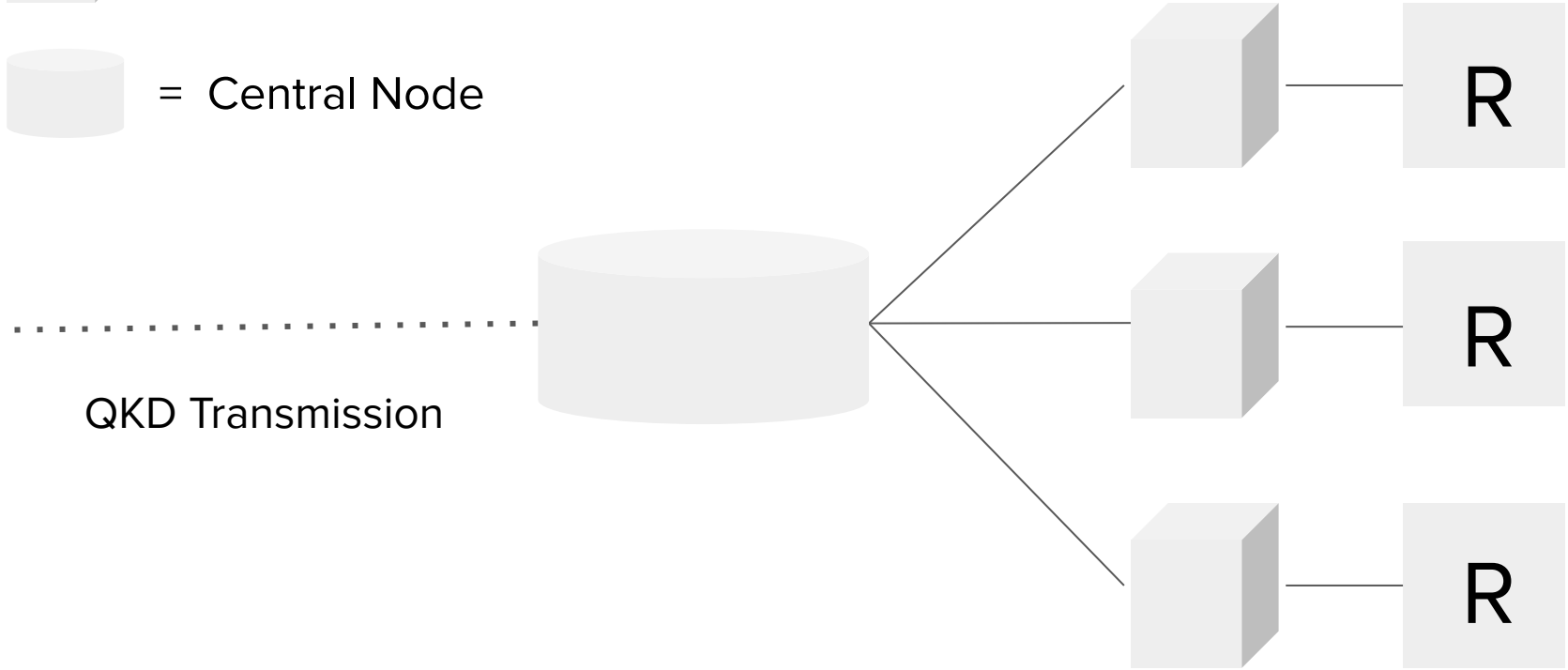
QKD Transmission



= Datacenter



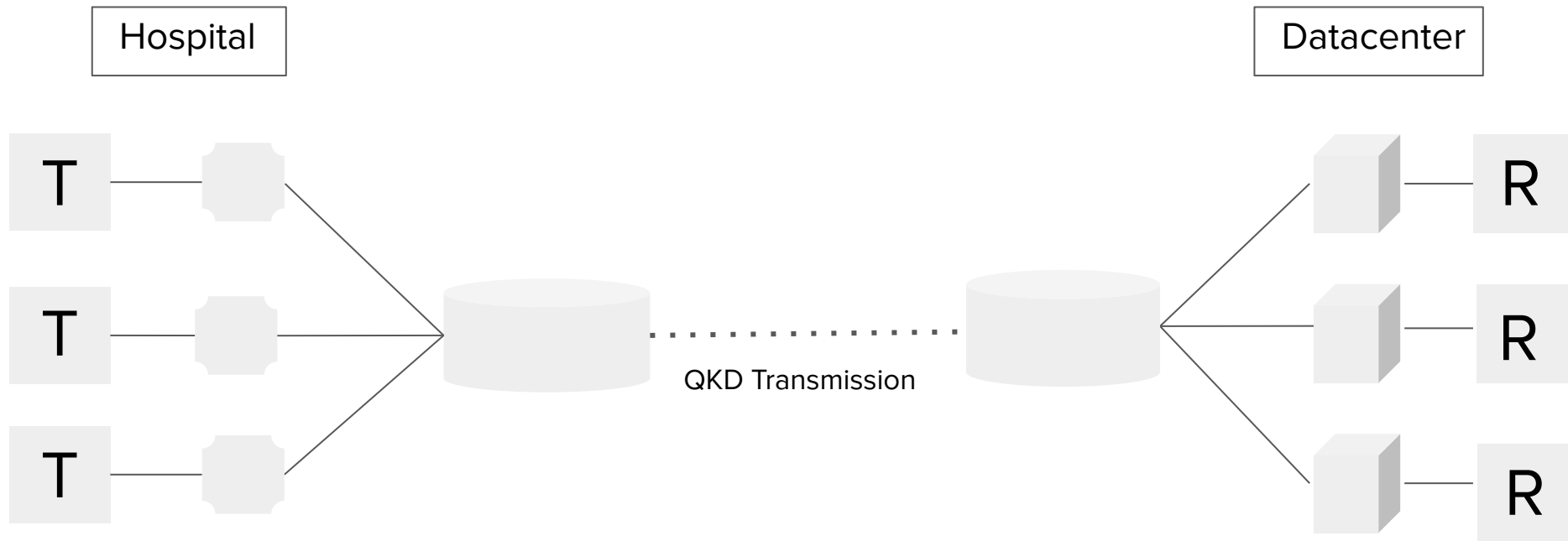
= Central Node



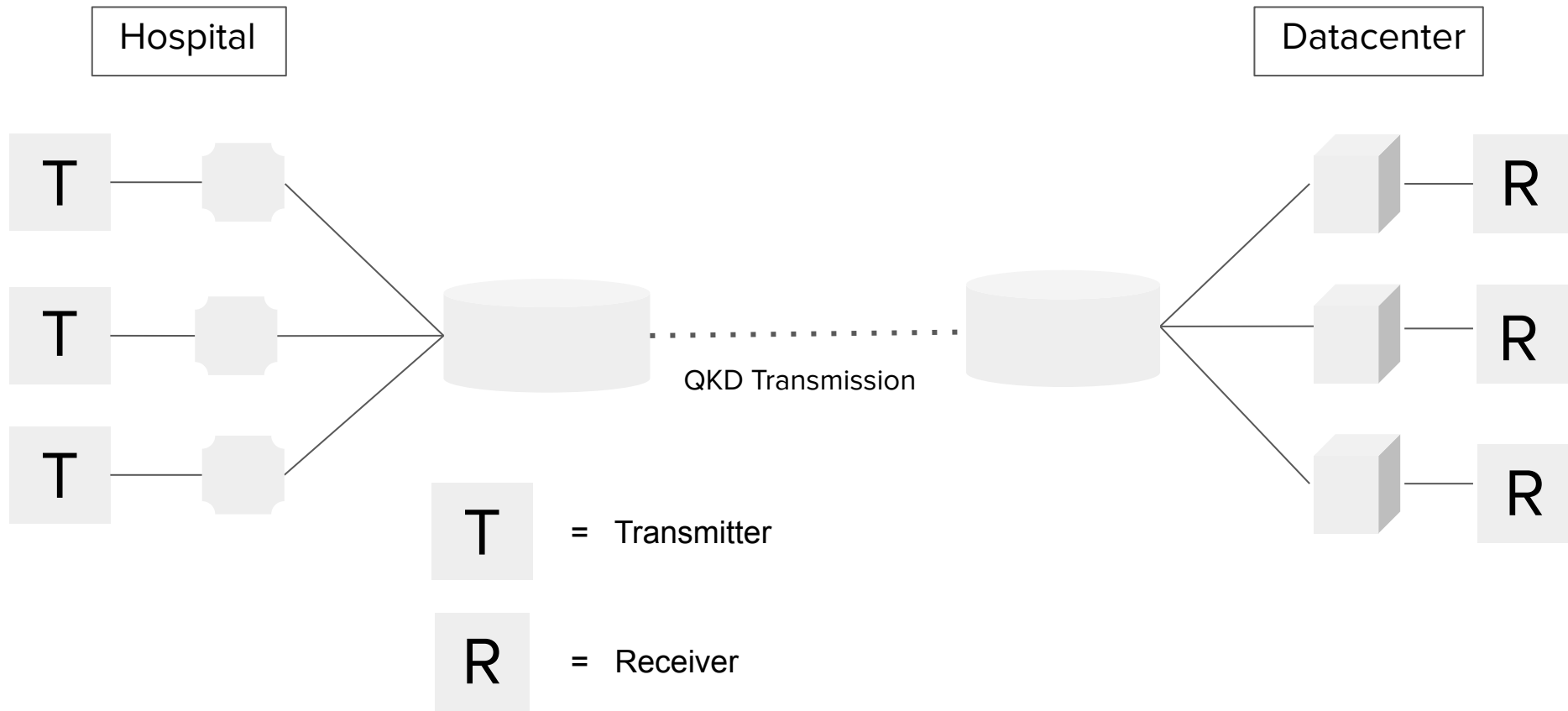
QKD Transmission



qIoT Device Scheme



qIoT Device Scheme





Local-Based Repeaters

Repeater



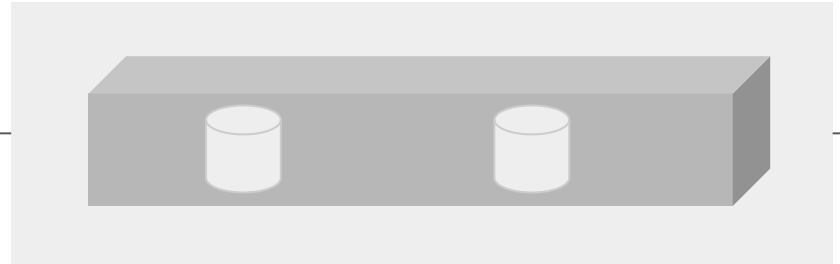
Measurement Device



Photon Source

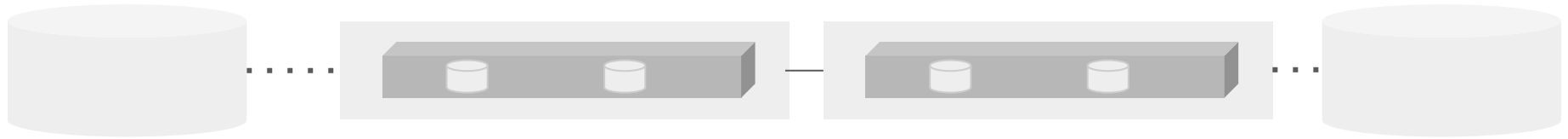


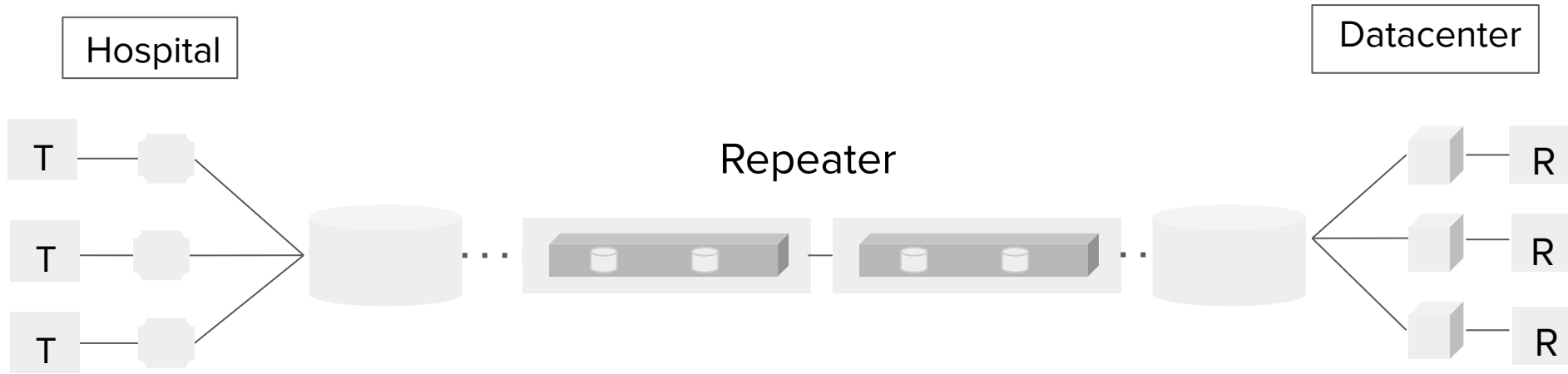
Q Memory Device

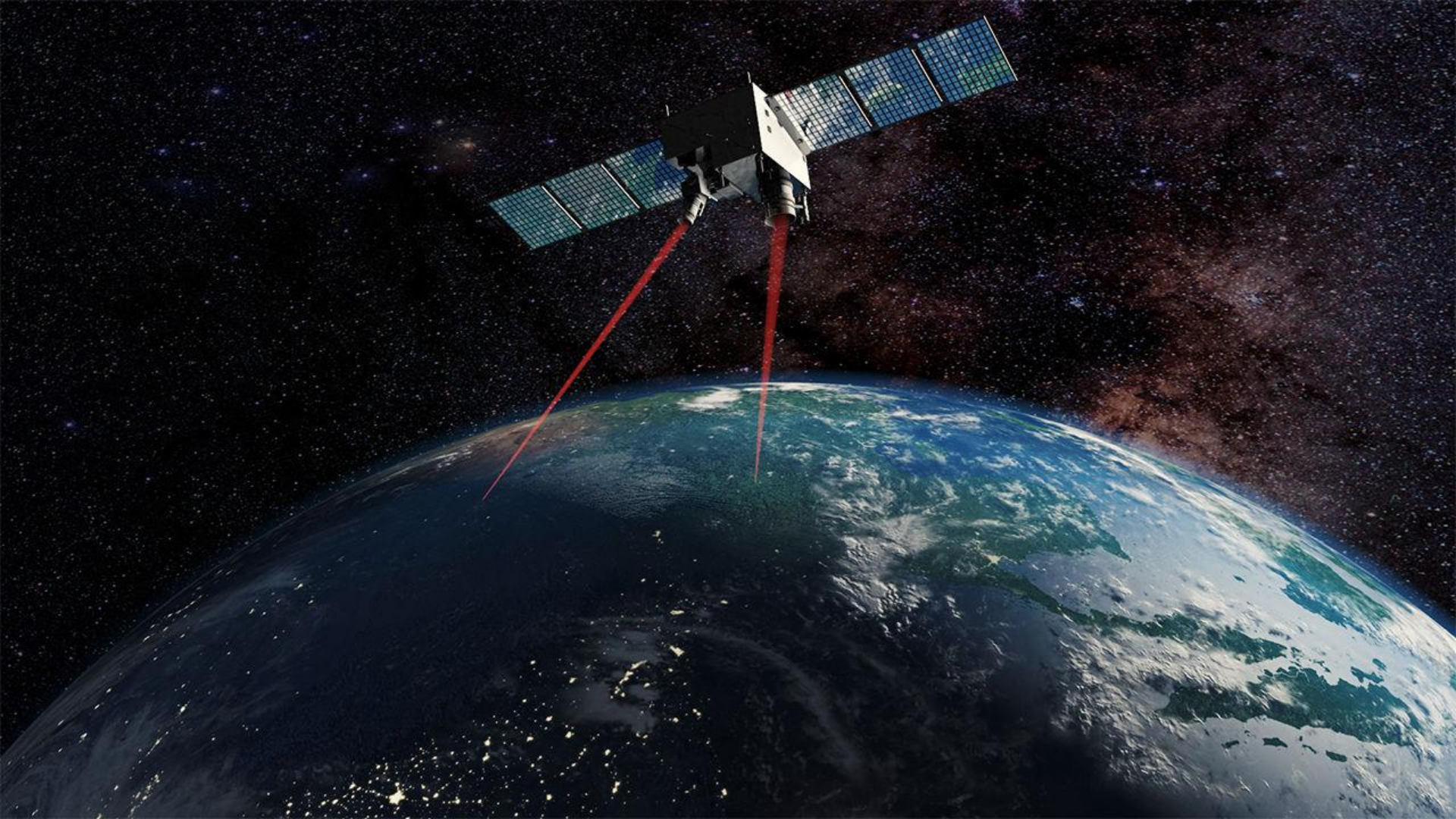


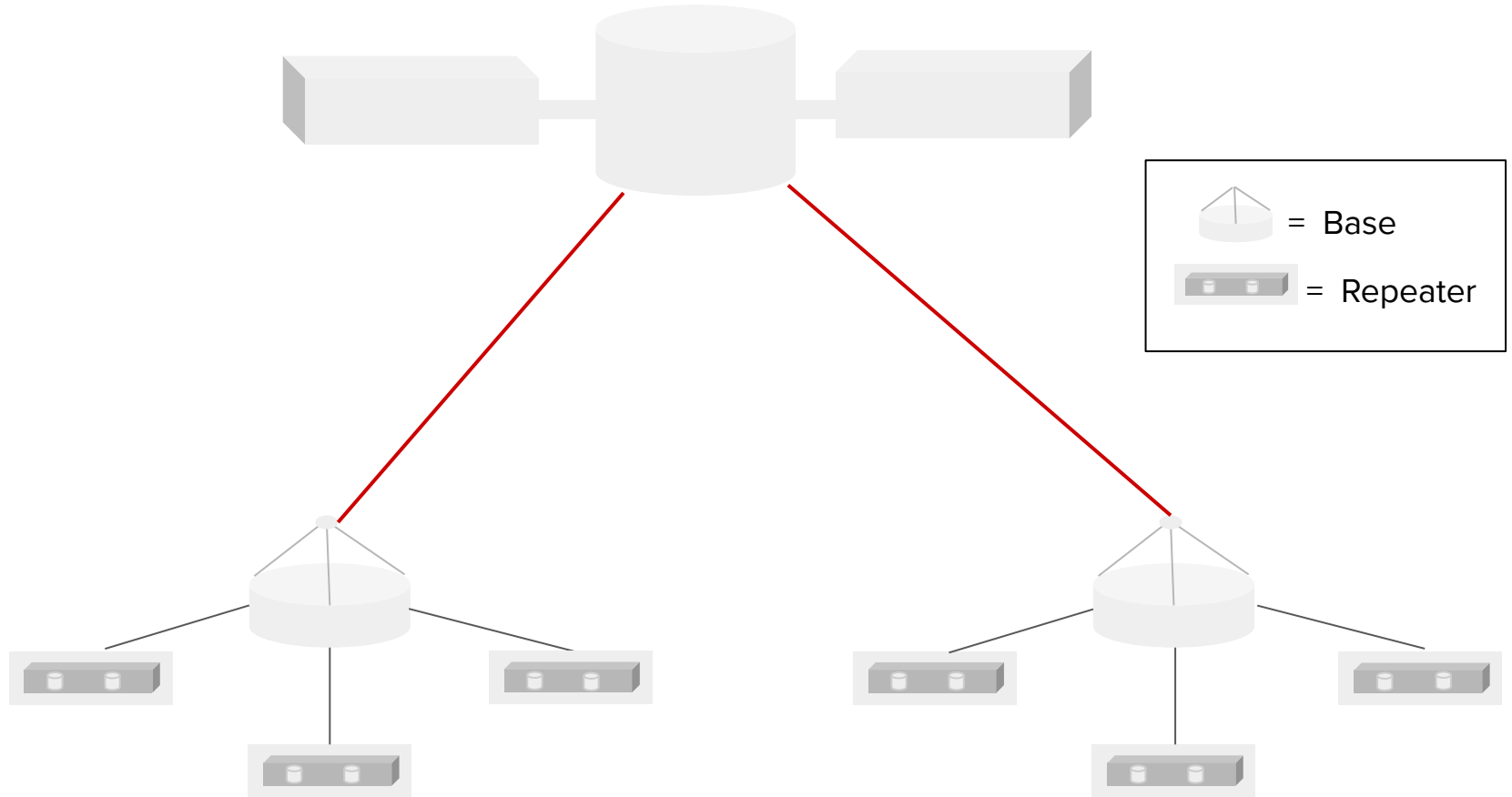
Q Memory Device

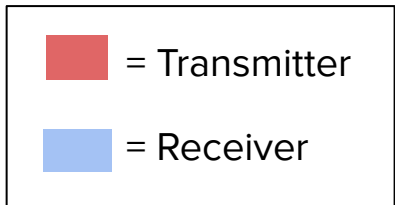
Repeater





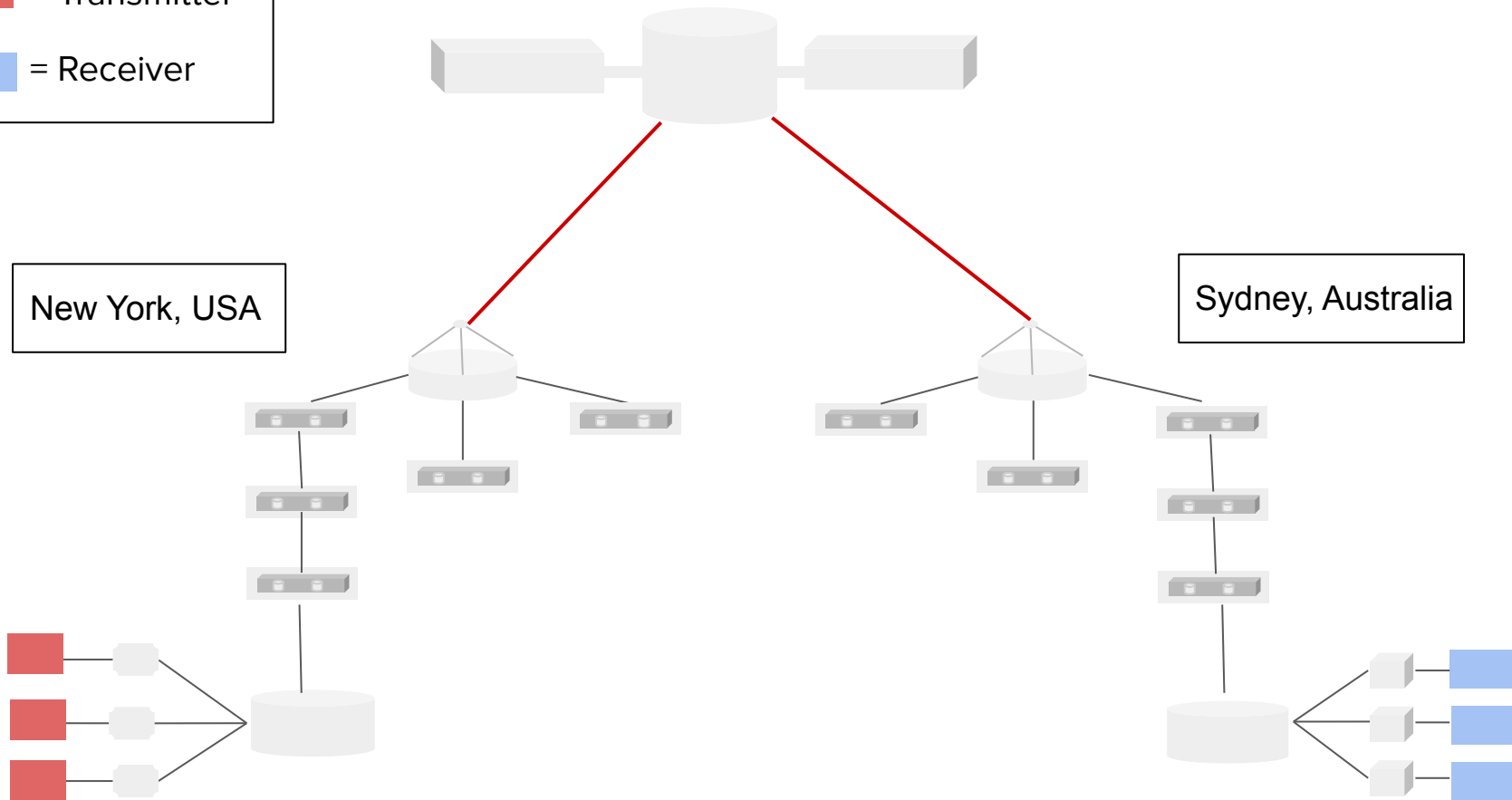






New York, USA

Sydney, Australia



Potential

Classical vs. Quantum Network Potential

5G	QG
<ul style="list-style-type: none">• <i>Encryption Speed</i> 10 Gbps	<ul style="list-style-type: none">• <i>Encryption Speed</i> 100 Gbps
<ul style="list-style-type: none">• <i>Latency</i> 1 ms	<ul style="list-style-type: none">• <i>Latency</i> 0 ms
<ul style="list-style-type: none">• <i>Spectrum Efficiency</i> 30 bits/hz	<ul style="list-style-type: none">• <i>Spectrum Efficiency</i> 60 qubits/hz

Market Growth:

\$250 billion +





MICIUS

7600 km



Graz



Nanshan



Xinglong

2500km



Let's Connect



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Website: aliceliu.com