

# Use Case TAC

QED-C April 30, 2019

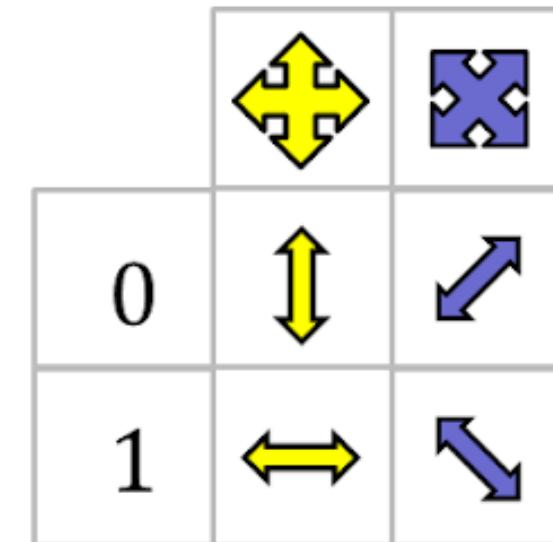
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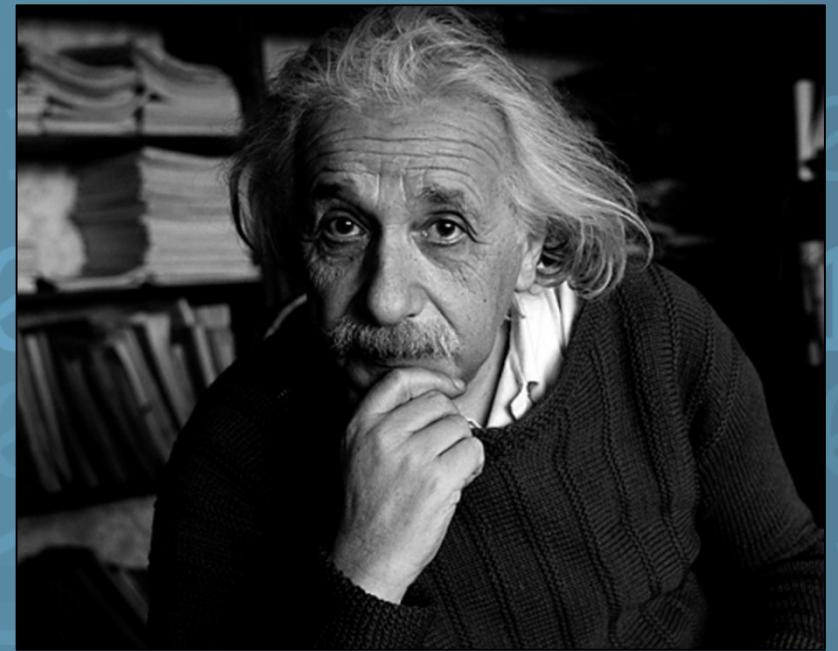
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# Emerging QKD Commercialization in the US



Quantum Key Distribution (QKD) provides secure distribution of symmetric keys:

- A hardware, not a software, solution
- Uses quantum physics to establish a shared secret “key” between parties
- Keys produced are perfectly random
- Keys cannot be “cracked” with any type of computer
- Keys can be used with AES235, for authentication, etc.



*“Spooky action at a distance”*

—Albert Einstein

# Commercialization History (35 years)

QKD  
Developed  
(BB84)

MAGIQ  
Founded

NuCrypt  
Founded

DARPA Quantum  
Network  
(BBN)

Beijing to  
Shanghai  
2,000 km  
Fiber Line  
(China)

Quantum  
Exchange  
Founded

1<sup>st</sup> Movers

2<sup>nd</sup> Movers

1984      1990

2000

2010

2019



ID Quantique  
Founded

SECOQC and  
SwissQuantum  
(EU Quantum  
Network)

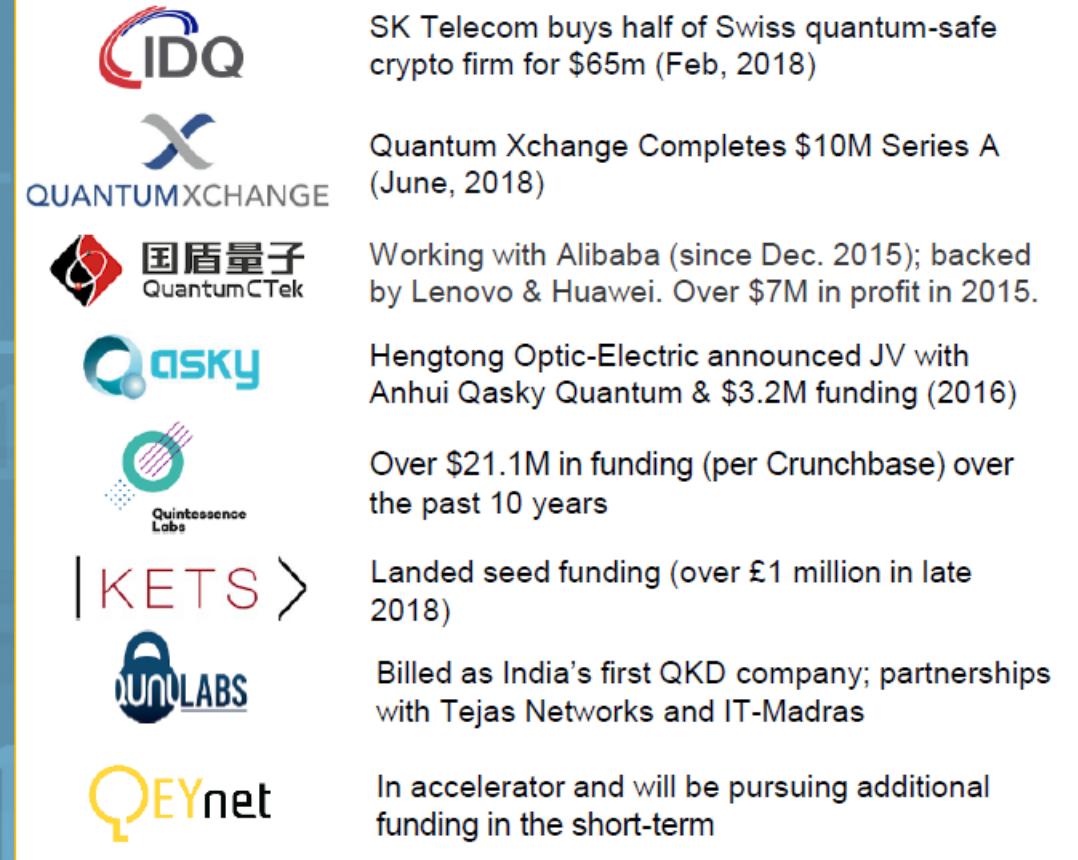
Qubitekk QKD  
system tested at  
SDG&E

Hype Cycle

# Private Investment in QKD...

## Latest Trends:

1. Majority of investment is in companies outside of the US
2. A few stealth QKD startups in US and Canada (not yet on radar)
3. Starting to see more QKD service providers (as opposed to hardware manufacturers) securing funding



**Recent Investment Activity**  
(reprint: Adapt IP, LLC)

If QKD continues to struggle commercially, will it feed the narrative that quantum technology is over-hyped?



BRUCE SCHNEIER SECURITY 10.15.08 09:00 PM

# QUANTUM CRYPTOGRAPHY: AS AWESOME AS IT IS POINTLESS

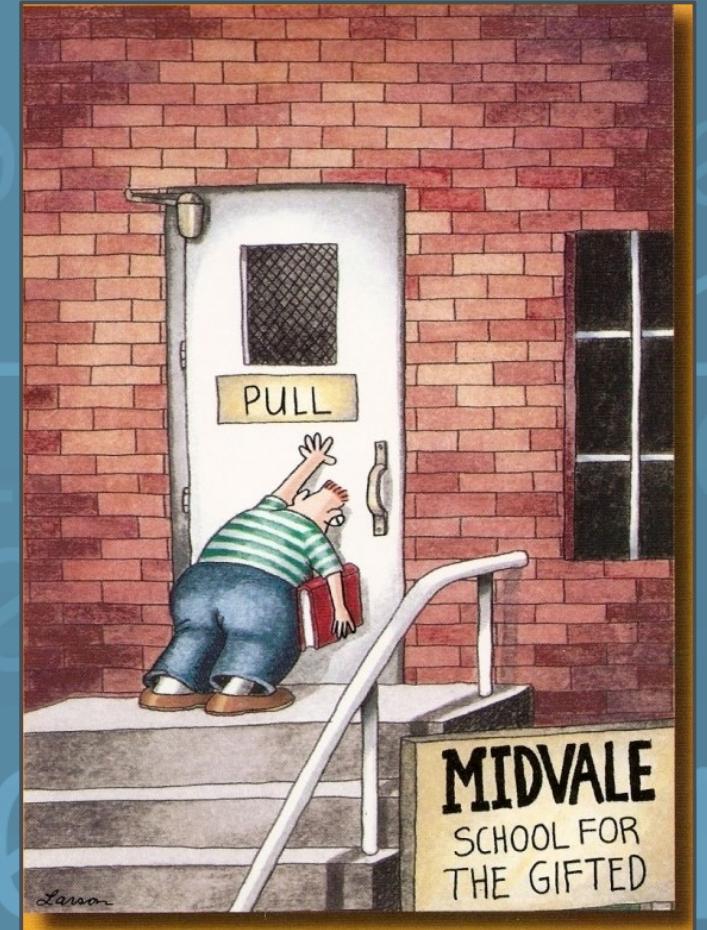
QUANTUM CRYPTOGRAPHY IS back in the news, and the basic idea is still unbelievably cool, in theory, and nearly useless in real life.

- Commercial QKD available now using quantum entanglement
- Entanglement-based QKD networks can teleport quantum states (useful to QC)
- Commercial development of narrowband entangled photon sources for DWDM QKD (useful for photon-matter qubits)
- Commercial QKD products have potential to:
  - Leverage production process and volumes to deliver rugged and compact quantum entangled photon sources and single photon detectors
  - Standardize entangled photon source characterization and QKD integration with 3<sup>rd</sup> party devices
- QKD technology roadmaps working toward synergies with quantum computing network roadmaps.



# Our problem...

*Because our market approach  
has not evolved... We have the  
wrong pitch, the wrong  
customer, and anemic sales.*

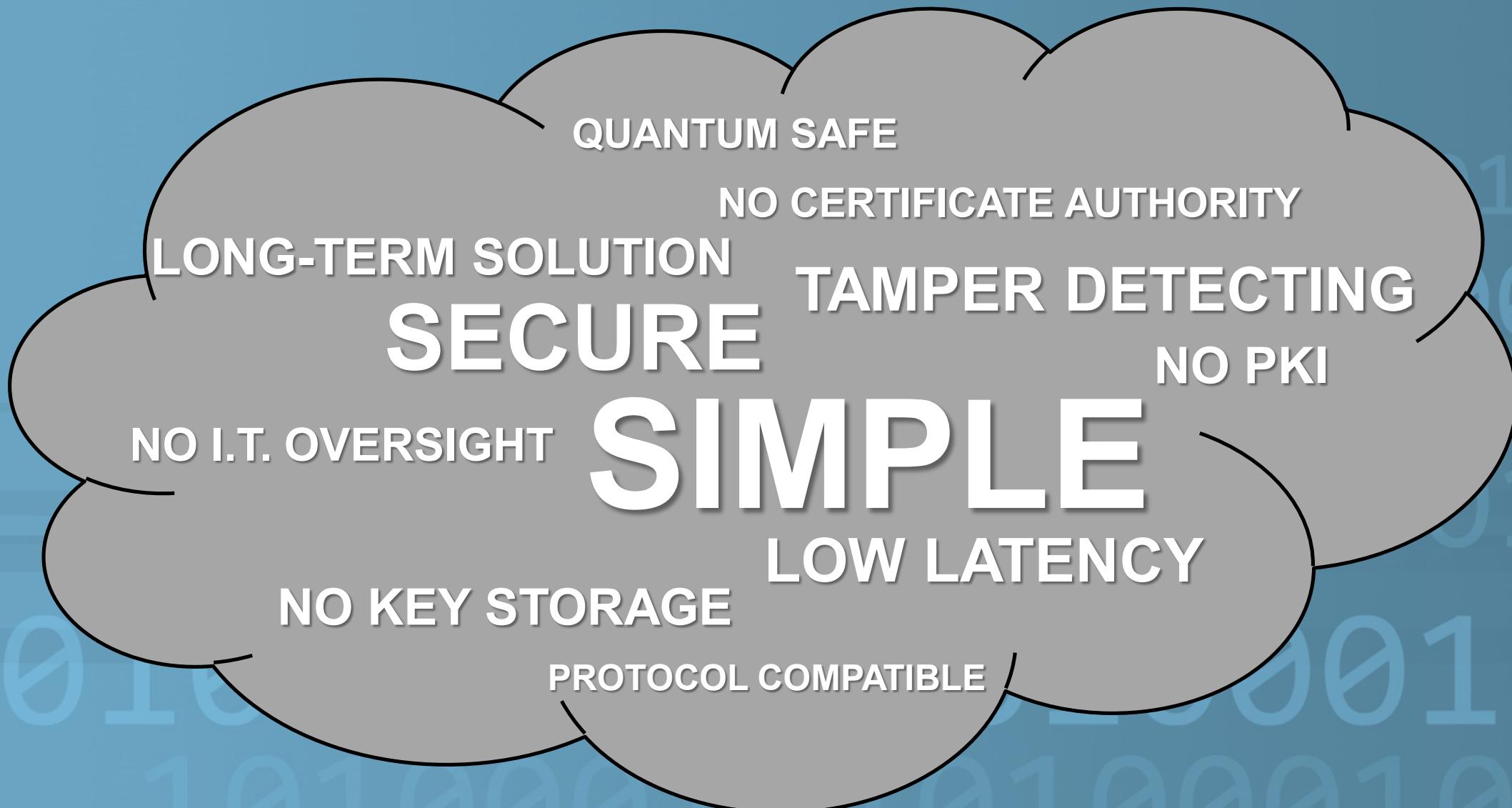


Reprint: Copyright, Gary Larson,  
*The Far Side*.

# It starts with the right customer...

- Critical industrial control systems (ICS) networks – like the power grid – are distributed machines.
- How do you add cyber security to the control of a “machine” without increasing operational complexity? (classical encryption only makes things worse)
- “The more security we add, the more things break!” – ICS customer comment
- For critical infrastructure, losing control (failure) is not an option.
- Many ICS networks have low data rate requirements and short transmission distances (<20km) – Perfect for QKD!
- Often, optical fibers are already in place. – Perfect for QKD!

# The Benefits of QKD to ICS...

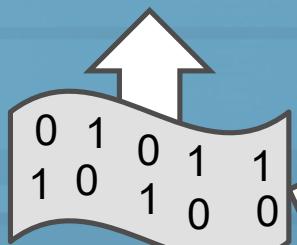


# QKD for Industrial Control Systems (ICS)

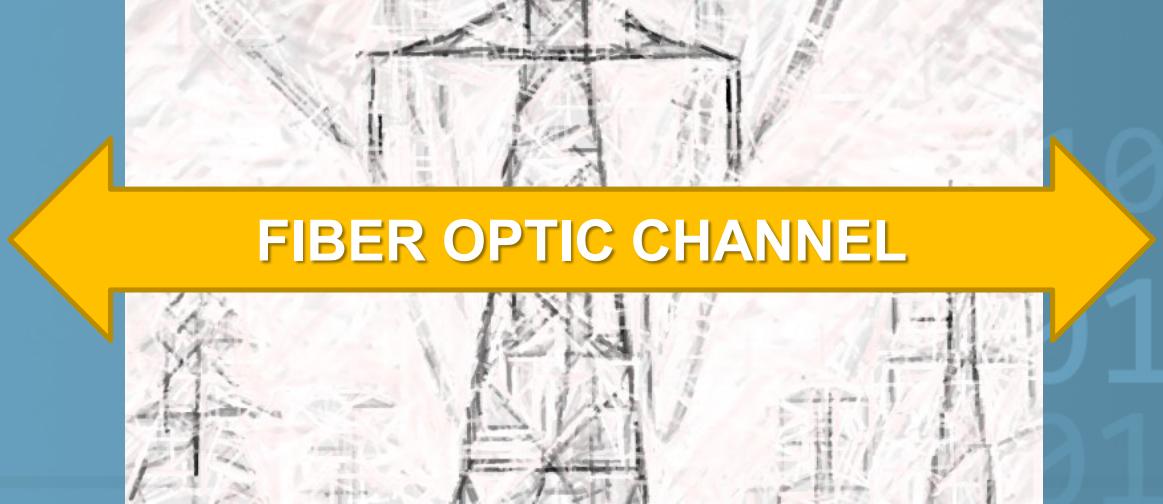
SUBSTATION



256-Bit  
Key Hand-Off



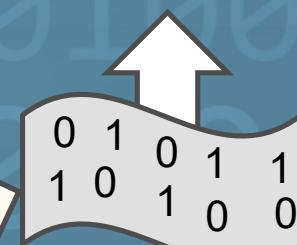
QKD Transceiver



SUBSTATION



256-Bit  
Key Hand-Off



QKD Transceiver

# Quantum Key Distribution (QKD) Product

## INTEGRATION

USB integration with 3<sup>rd</sup> party devices implementing SSP-21 protocol



## EMBEDDED ENTANGLED PHOTON SOURCE

Using entangled photons to establish a “secret key” between two parties

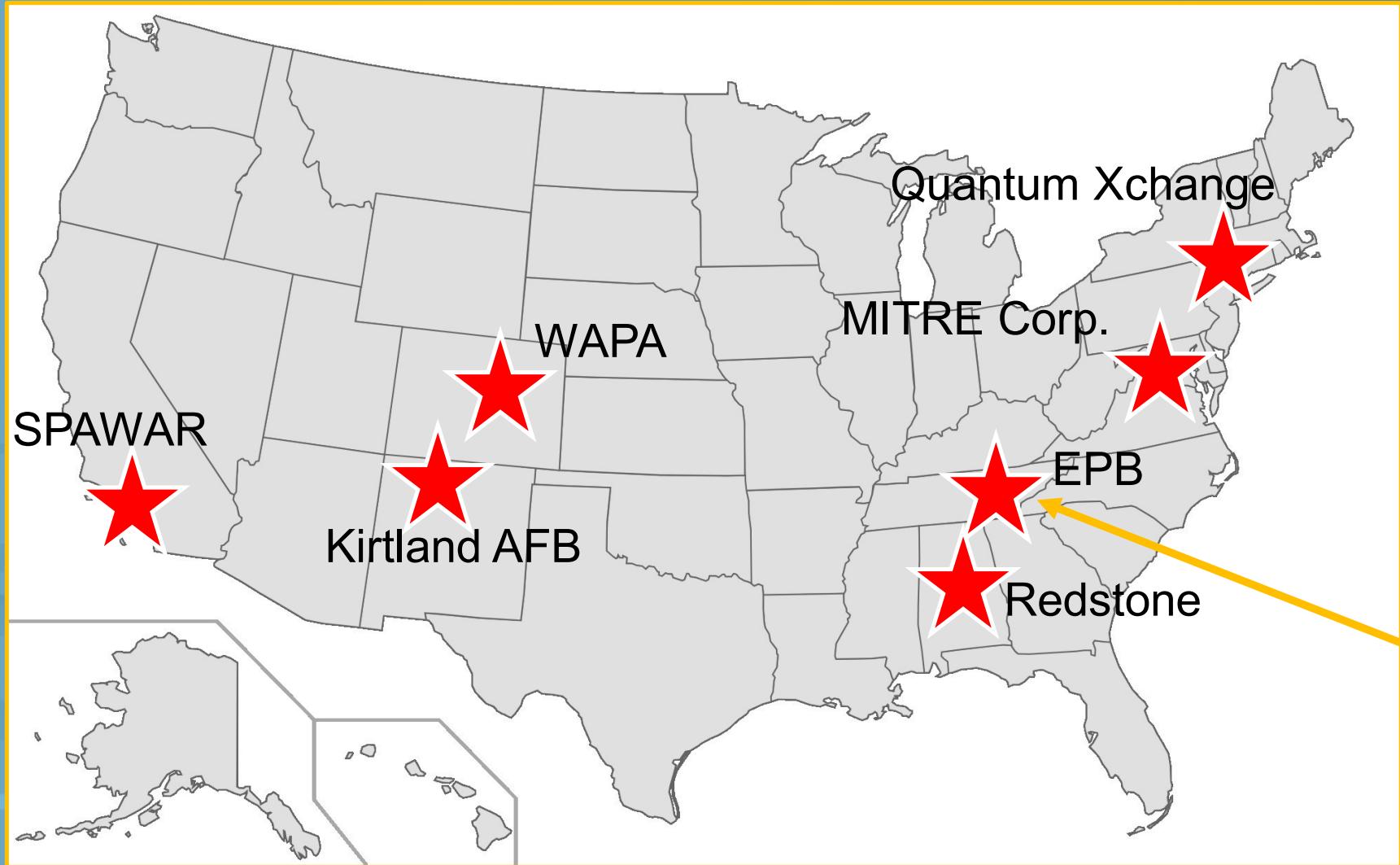
## FIBER CONNECTED

Telecom optical fiber used to connect two or more QKD transceivers

## NETWORK CONTROL

Syslog events provide diagnostic and alarm information to SPLUNK and other network management tools

# Benefit-Centric Demonstrations in 2019



Utility Demonstration  
in TN