

Let's Talk About Quantum: Read Lisa Finneran's Latest Blog Post and See William Clark's TIE Talk on Quantum Technology

Following is an excerpt from Vice President of Engineering Lisa Finneran's blog – [Imagine. Inspire. Innovate](#) – that focuses on one of the top tech trends our engineering team is focused on in 2019: Quantum.

Imagine a computing machine and associated algorithms that will change and shape our current paradigms by solving computational problems that are currently out of reach. Welcome to the world of Quantum 2.0!

Quantum technology uses unique features of quantum mechanics to provide disruptive new capabilities and levels of performance. As our own **Dr. William Clark** and **Dr. Mark Adcock** recently explained to the GDMS leadership team, quantum technologies will enable a host of capabilities, such as:

- unconditional, physics-based security and encryption
- inherent resistance to interference and jamming
- enhanced stealth and covertness
- improved positioning, navigation, and timing, and
- computational speed for data-intensive applications like machine learning.

The differences between the computing infrastructure we have today and quantum computing infrastructure can be summarized by three distinct differences – bits and qubits, entanglement and concurrency. Simply stated, unlike binary bits which have a state of 1 or 0, qubits can inhabit states of 1 and 0 at the same time. Quantum computing works on the entanglement of qubits – manipulating one qubit, you simultaneously manipulate all of its entangled mates. Lastly, binary computers conduct arithmetic calculations sequentially while quantum computers calculate all possible outcomes concurrently and determine the potentially correct answer through constructive interference.

In her interesting TED Talk, "[Quantum computing explained in 10 minutes](#)," TED Fellow Shohini Ghose uses a simple analogy to underscore the extraordinary difference. "A quantum computer is not just a more powerful version of our current computers, just like a light bulb is not a more powerful candle. You cannot build a light bulb by building better and better candles. A light bulb is a different technology, based on deeper scientific understanding. Similarly, a quantum computer is a new kind of device, based on the science of quantum physics, and just like a light bulb transformed society, quantum computers have the potential to impact so many aspects of our lives, including our security needs, our health care and even the internet." For a more in-depth explanation of quantum entanglement, watch "Einstein's Quantum Riddle" on PBS NOVA.

See GDMS' Dr. William Clark present the latest TIE Talk on Quantum Technology.

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If you're a "techie," you've probably read or heard something in recent years about Quantum Computing, Quantum Key Generation and Distribution (QKD), Quantum Secure Communications and Quantum Radar. What you probably don't realize is we are at the start of a new revolution in Quantum Physics and Technology, referred to as Quantum 2.0, and this revolution is likely to be even more radical than the Quantum 1.0 revolution of the 20th century, which gave rise to analog and digital electronics, computing, communications, sensing, nuclear weapons and energy, and the information age. If Quantum 2.0 sounds interesting to you, and you would like to better understand how it may shape the 21st century, you will want to watch this latest TIE Talk on Quantum Technology.

It's truly a whole new world, and currently China leads the world in the application of quantum communications and cryptography systems. In August of 2016, China launched a quantum satellite called Micius – named after a Chinese philosopher in the fifth century B.C. – into low earth orbit. Base stations installed in Ngari and Xinglong, near Beijing, allow quantum encrypted communications to occur between at least 600 top Chinese ministers and military officials. The U.S. and its allies must make a concerted effort to catch up with and surpass China in quantum capabilities and applications to stay competitive and protect our national interests, and at GDMS we're already exploring how our U.S. tactical and communication systems could be secured and enhanced using quantum-based technologies.

At GDMS, we are actively investing in quantum technologies to:

- develop system architecture and simulation tools
- demonstrate quantum secure and covert optical communications and narrow-band sensing
- develop an internal laboratory for research and development and demonstrations with customers
- research and develop quantum-enhanced RF transmitters and receivers
- patent quantum methods and apparatus developed under our internal research and development (IRAD) efforts
- participate in select conferences, such as QED-C
- develop a quantum engineering workforce to develop products and systems
- bid and propose quantum-enabled solutions to solve the evolving challenges faced by our key customers

We aim to own the distinction of moving quantum technology out of the lab and into mission solutions, and a key step is to become more quantum-aware as a workforce, with our in-house experts leading the way. If you haven't already read about William Clark and his insights on quantum and how we're working to usher in a new era for GDMS, I encourage you to check out this series of articles on Hub:

- [Quantum 2.0 Revolutionizing Secure Communications and Sensing](#)
- [Power of Partnerships: Work with NASA, Universities Key to Advancing Quantum Technology](#)

There is ample opportunity to imagine, inspire and innovate within this extraordinary new world of quantum. Are you as excited about it as I am? Share your thoughts in the comments below.