Quantum Computing

The Inflection Point: From Theoretical Physics to Commercial Reality

mp *Thematic Guide*

2025 State of Quantum Computing: We are transitioning from a lab curiousity to a utility.

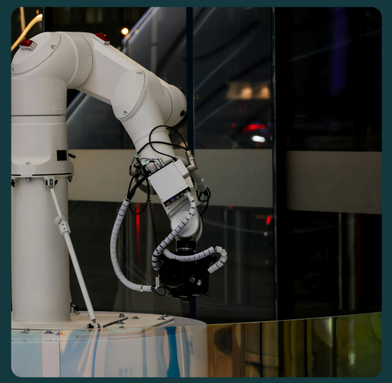
Scientific Validation

The 2025 Nobel Prize in Physics (Clarke, Devoret, Martinis) and Google's "Willow" processor (105 qubits) have officially legitimized superconducting qubit approach.

Capital Influx

The capital raised in 2025 for Quantum Computing was more than the past 14 years of funding combined, according to Evercore's *Perspectives on Quantum Computing* report.

Technological Certainty



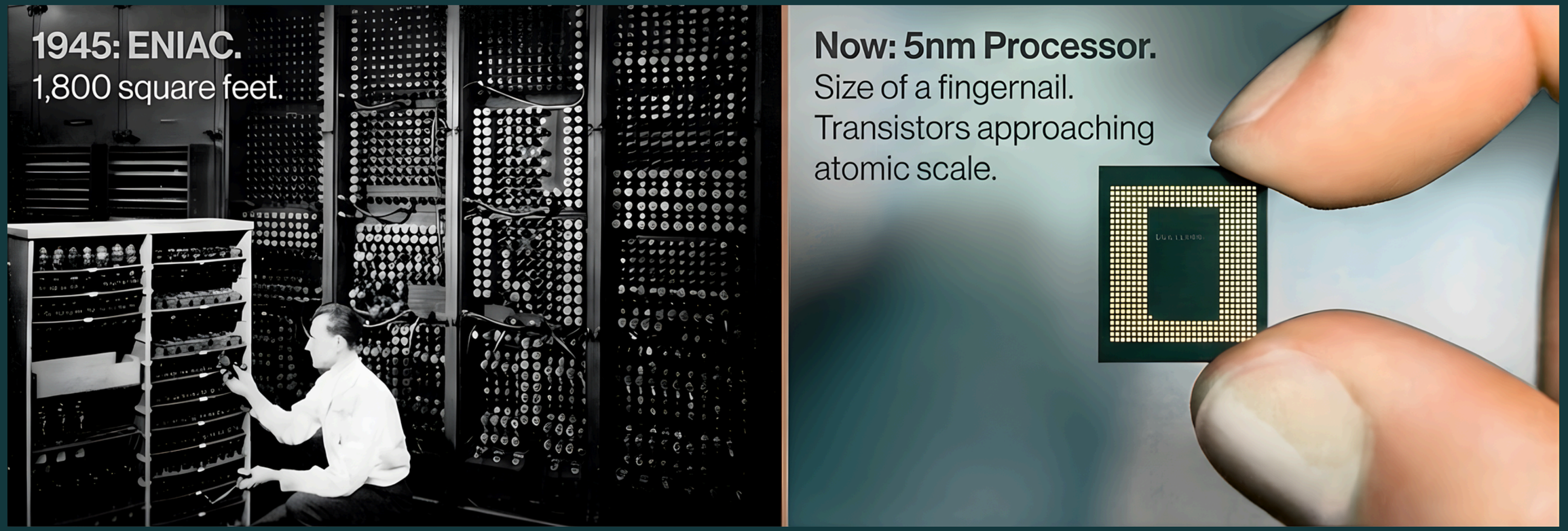
IBM's roadmap targets fault tolerant quantum computer by 2029. The industry is moving from theoretical "if" to engineering "when."

Defense & Policy

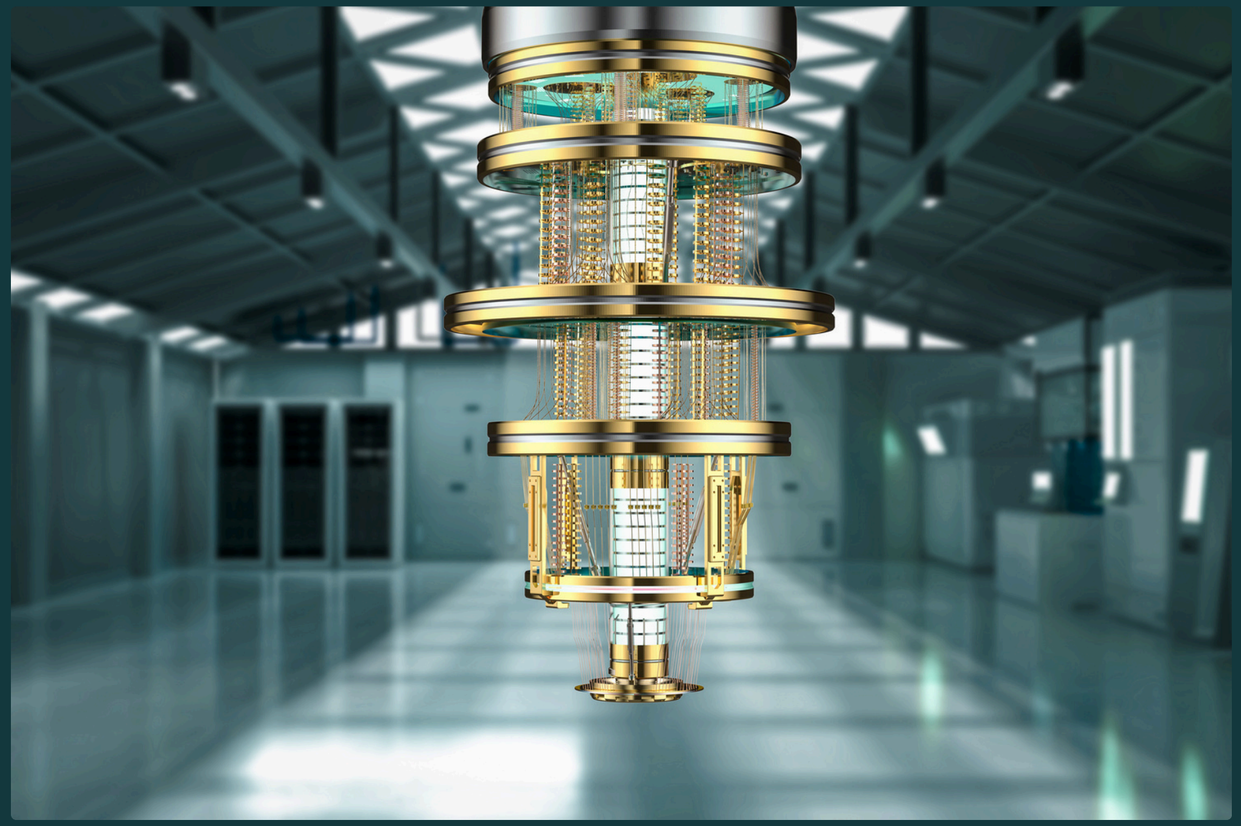
China leads in quantum with 32% of global patent applications and $15 billion investment. The US has designated quantum a national security imperative.

A limitation of Classical Computers: Moore’s Law is hitting a physical barrier.

Since the 1960's, classical computing power grew through miniaturization. But we are close to the limit of classical computers since we can’t shrink transistors smaller than atoms.



A quantum computer isn't just a faster computer, just like a light bulb isn't a more powerful candle.



What is a quantum computer?

Classical computers process information using bits existing as 0 or 1. Quantum computers use qubits (quantum bits) and the principles of quantum mechanics. Quantum computers harness three quantum mechanics principles: superposition (exploring multiple solutions simultaneously), entanglement (linking qubits so they become part of the same system), and interference (amplifying correct answers while canceling wrong ones). This enables exponential scaling: 100 qubits can represent more information states than atoms on Earth.

Quantum computing promises to go from binary logic to fluid, exponential power.

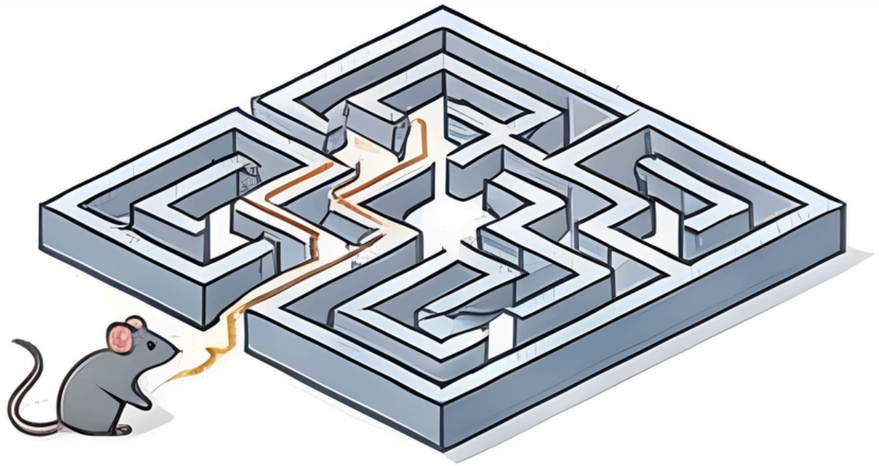
While classical computers rely on rigid binary bits to process information sequentially, quantum computers use qubits for simultaneous processing, solving previously intractable problems.

Old Way: Classical	New Way: Quantum
Rigid Binary Bits (0 or 1)	Fluid Qubits (Superposition)
Sequential individual problem solving	Simultaneous (all options) problem testing
Simulations are approximate estimates	Exact simulation of nature

The benefit of Quantum Computing: The mouse in the maze vs. the bird's-eye view

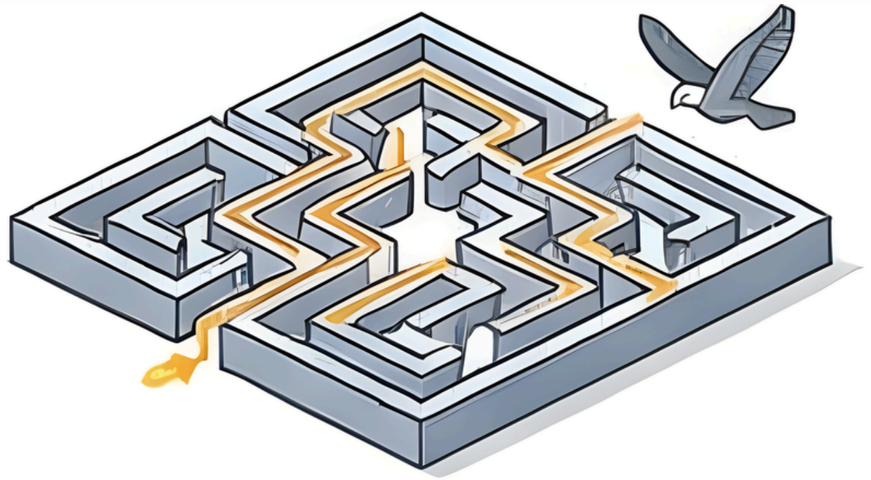
Simultaneous processing power allows quantum computers to solve complex problems in minutes that would take classical machines millions of years to solve.

Classical computers: Sequential



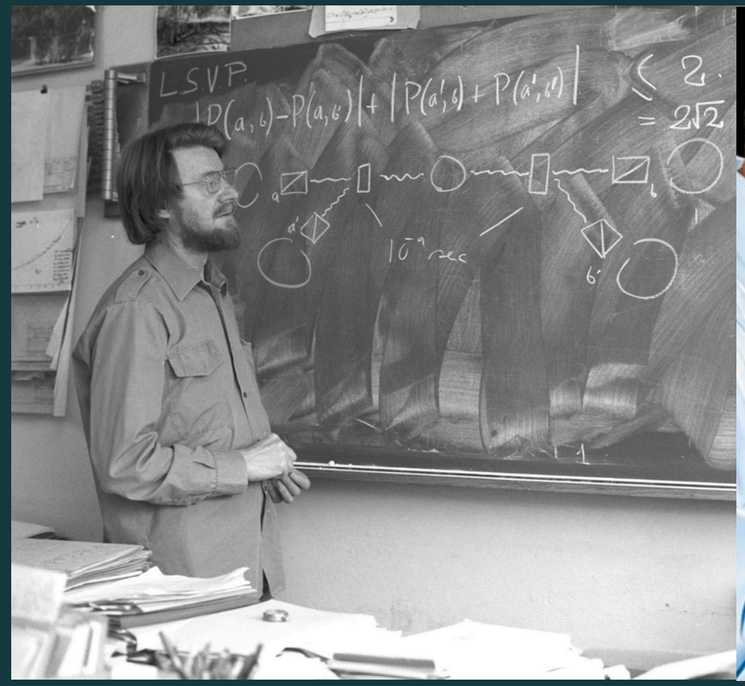
Classical computers test every path one-by-one

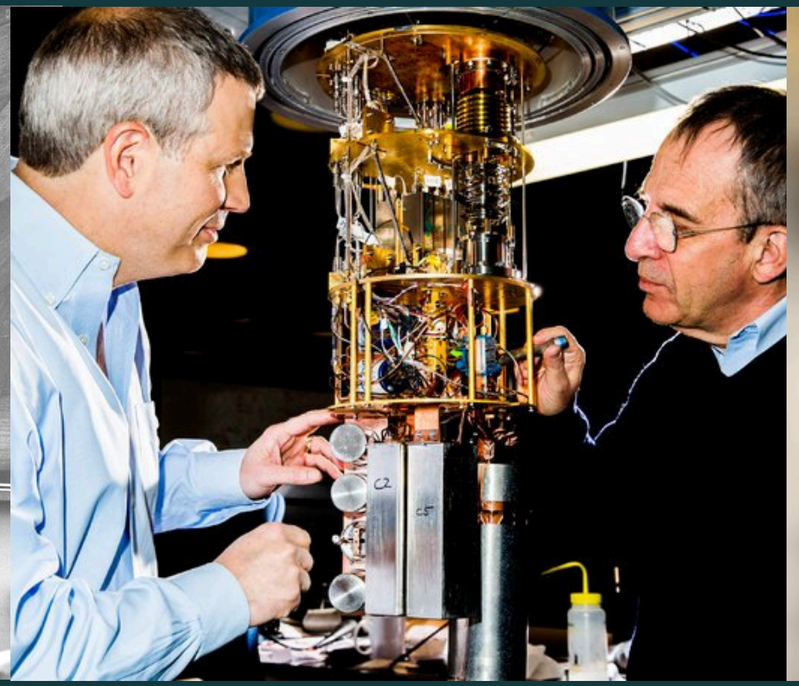
Quantum computers: Simultaneous

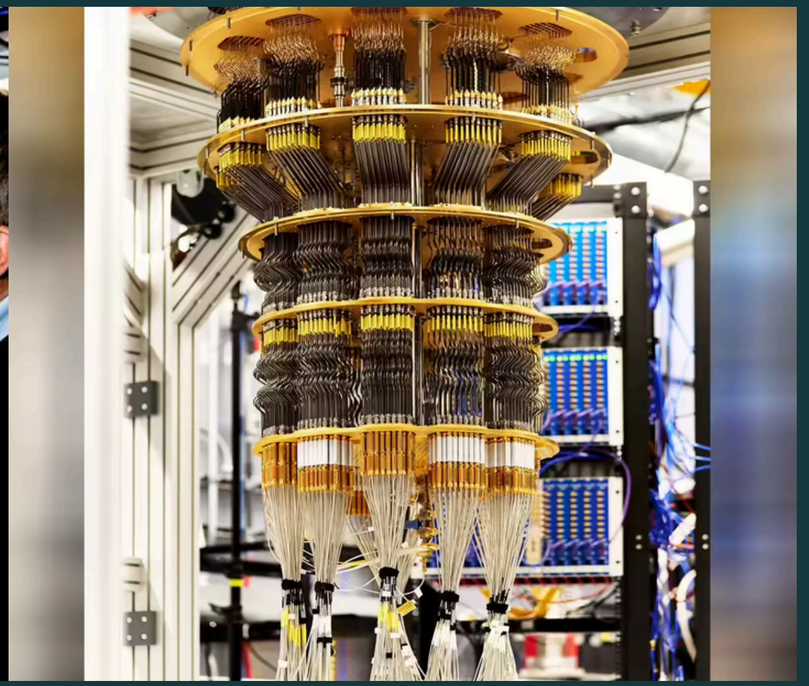


Quantum views the whole maze to find the exit

We are moving from the Theoretical Era and Experimental Era to the Engineering Era.



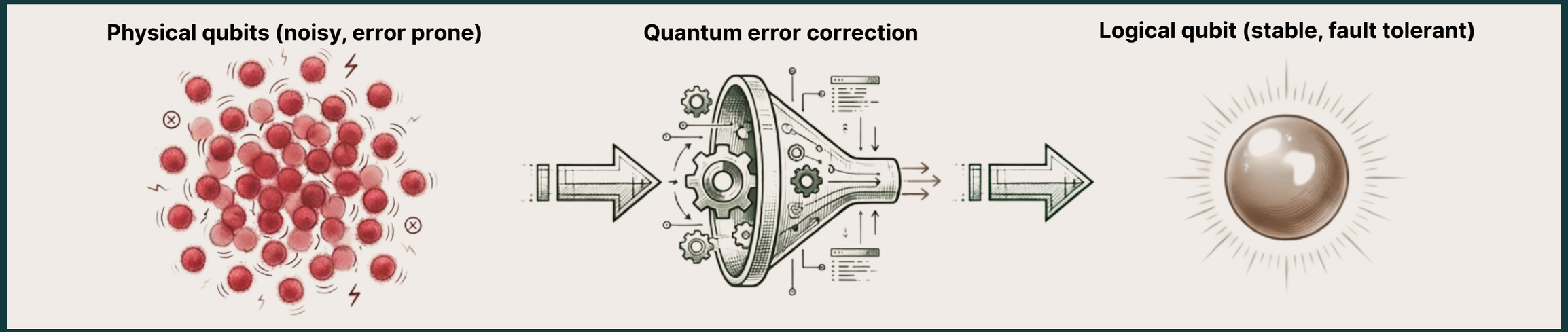




In late 2024, Google announced the Willow processor (pictured right), a 105-qubit system that solved the “Quantum Catch-22.” Historically, adding more qubits (i.e. processing potential) increased noise and error rate. Willow reached “break-even,” where adding physical qubits reduced the system’s total error.

Problem for Engineering Era: Today's quantum computers remain fragile and error-prone.

The holy grail for companies like IBM, Google, and IonQ is fault-tolerant quantum computing, as *physical qubits* (hardware like superconducting circuits or trapped ions) lose quantum information in microseconds due to environmental interaction and noise (i.e. "decoherence").

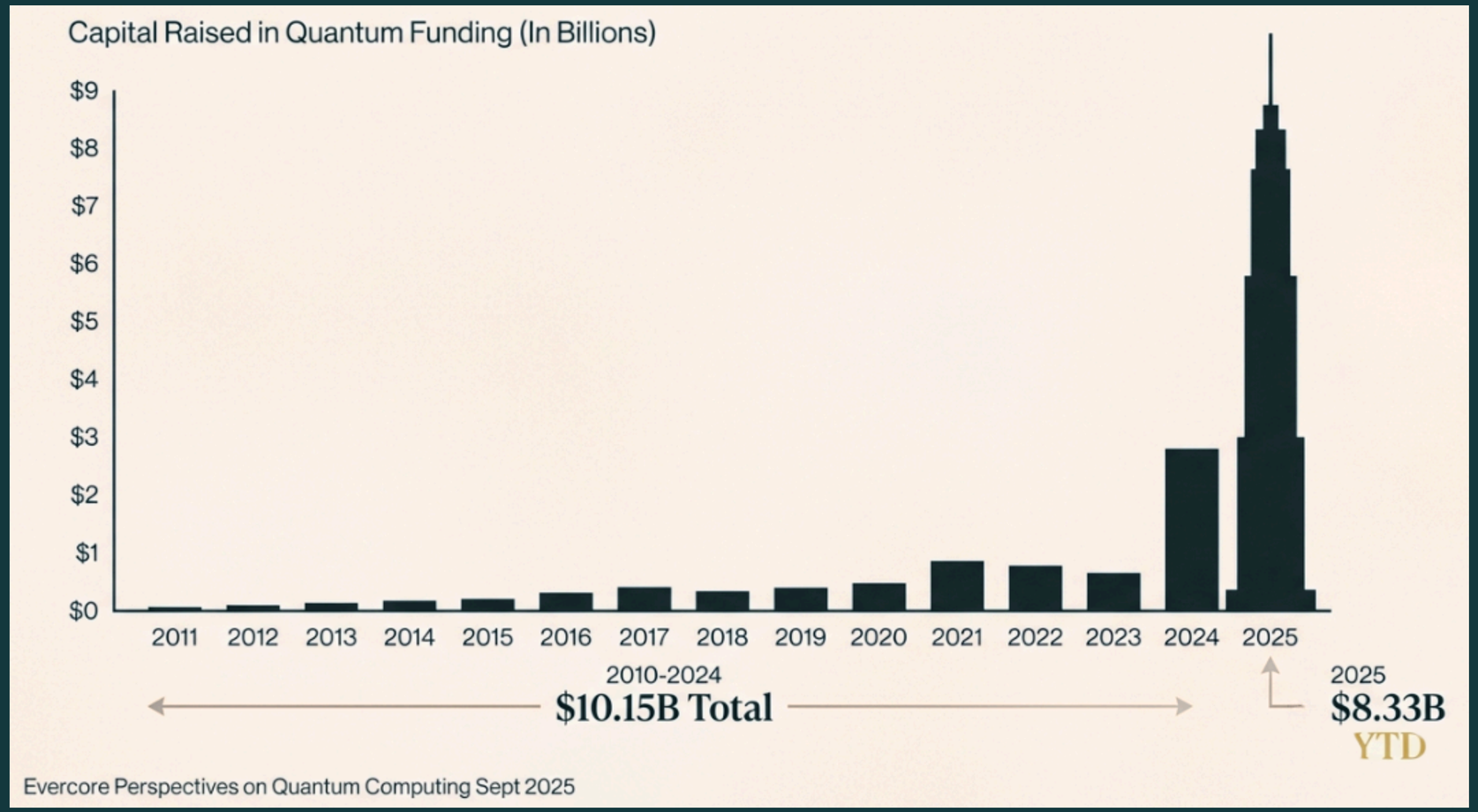


Quantum error correction creates robust *logical qubits* - reliable, "software-defined" units formed by grouping multiple physical qubits together. Today's systems can only produce one or two logical qubits from thousands of physical qubits. Breaking modern encryption (ECC and RSA) requires a few thousand logical qubits.

Speed vs. Fidelity: The tradeoff defining the Quantum race

Key Players	Modality	Winning Characteristic	Achilles Heel (Tradeoff)
Google, IBM, Rigetti	Superconducting	Fast gates; leverages existing chip factories.	High noise; requires massive cryogenic cooling infrastructure.
IonQ, Quantinuum	Trapped Ion	"Perfect" natural qubits; all-to-all connection.	Slow operation speeds; no existing supply chain for scaling.
QuEra, Pascal	Neutral Atom	3D arrays of atoms are highly reconfigurable.	Slower execution; nascent hardware ecosystem.
D-Wave	Quantum Annealing	Solves optimization problems now (Revenue).	Cannot perform universal computing (e.g., breaking encryption).

Capital follows breakthrough. 2025 quantum funding nearly surpassed last 14 yrs combined.



"We're moving from a world of science fiction to science fact. Last year's funding was nearly equivalent to the previous 14 years combined, which is insane, right?"

- William Hurley, CEO Strangeworks

McKinsey estimates quantum can unlock $2 trillion in economic value by 2035.

Pharmaceuticals

High fidelity simulation of chemical reactions to discover new drug compounds in months rather than a decade.

Finance

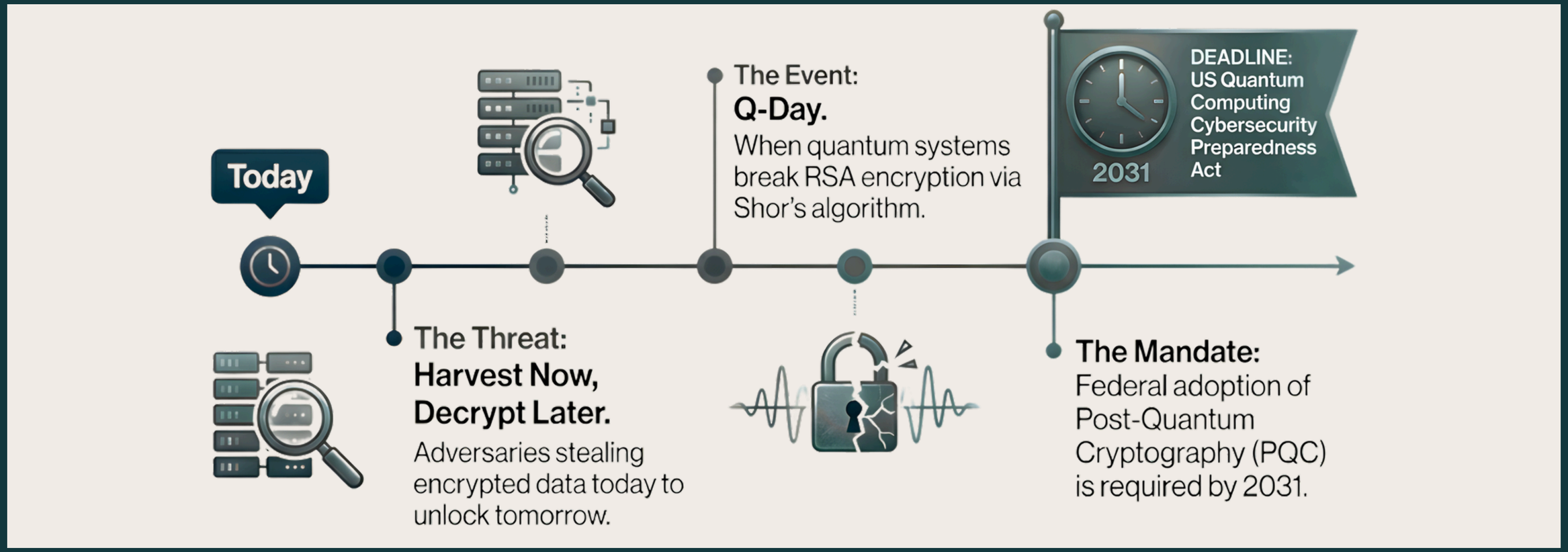
Quantum kernels for near-instant portfolio optimization, risk prediction. JPMorgan prioritizing quantum for risk analysis.

AI / ML

Quantum-enhanced AI for faster pattern recognition and advanced natural language processing.

> "If you tell a company, 'I have found a way that uses a quantum approach but that executes on GPU,' they're all ears. They don't buy the solution because of its quantumness. They buy it because of the efficiency." - Joe Ghalbouni, Ghalbouni Consulting

The clock is ticking on ‘Q-Day,’ an existential threat to encryption and investment catalyst.

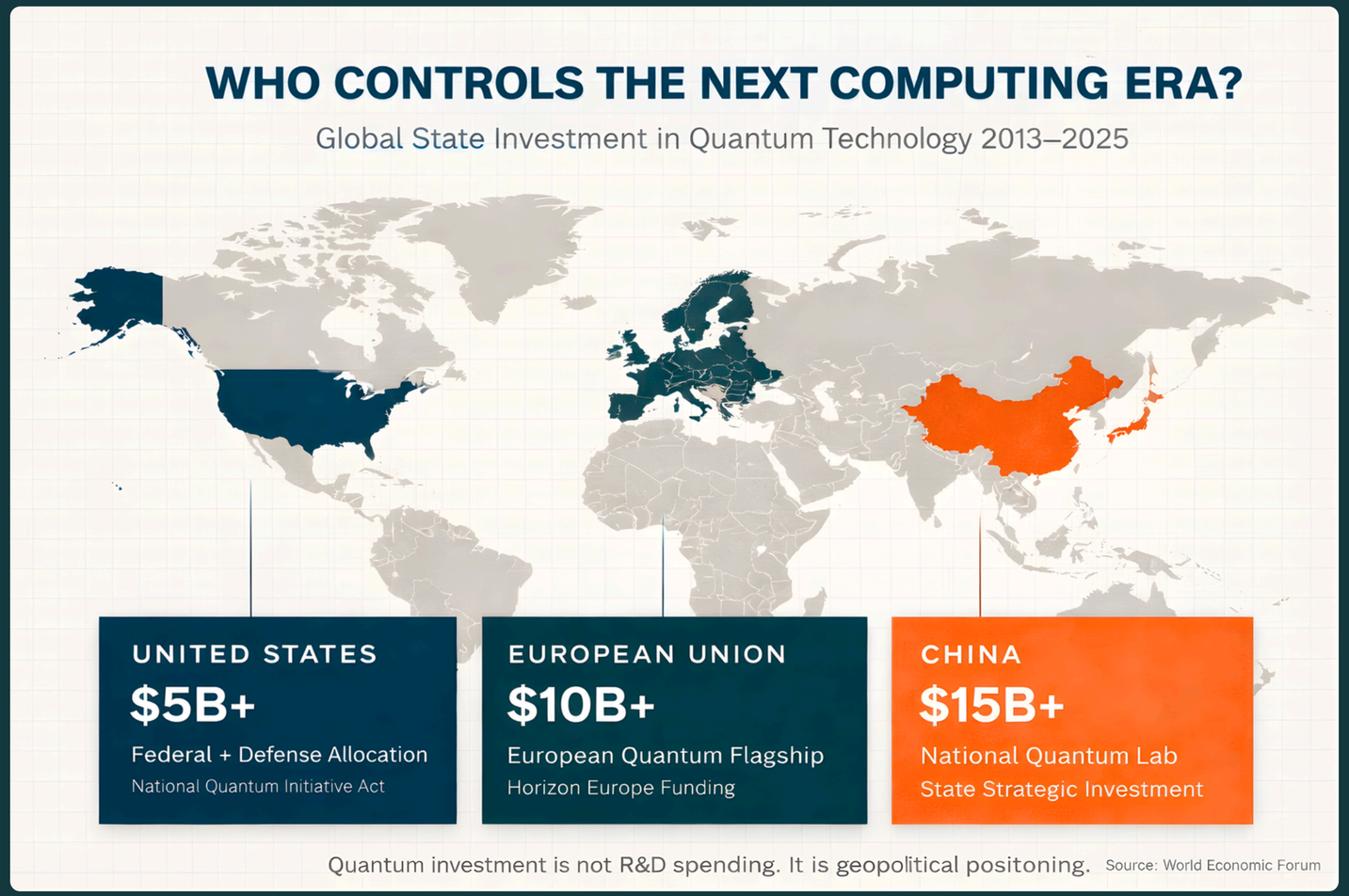


“Alongside artificial intelligence, quantum technology has the potential to be one of the most consequential technologies of this generation.” -Senator Mike Rounds (R-S.D.) on 1/8/2026

Technology is the new battleground of the global order.

> “China has emerged as both our preeminent geopolitical rival and our most formidable technological and scientific competitor... The shape of future global order will be defined by whomever leads across AI, quantum, nuclear, and other critical and emerging technologies.”

Michael Kratsios, Director of Office of Science and Technology Policy



Member Expert View: Nick Adams on Quantum Computing's strategic reality

Nick Adams
Managing Partner,
Differential Ventures

Q: What's the biggest quantum misconception right now?
A: That we need to wait for quantum. High-performance computing can achieve near-quantum performance in many specialized use cases.

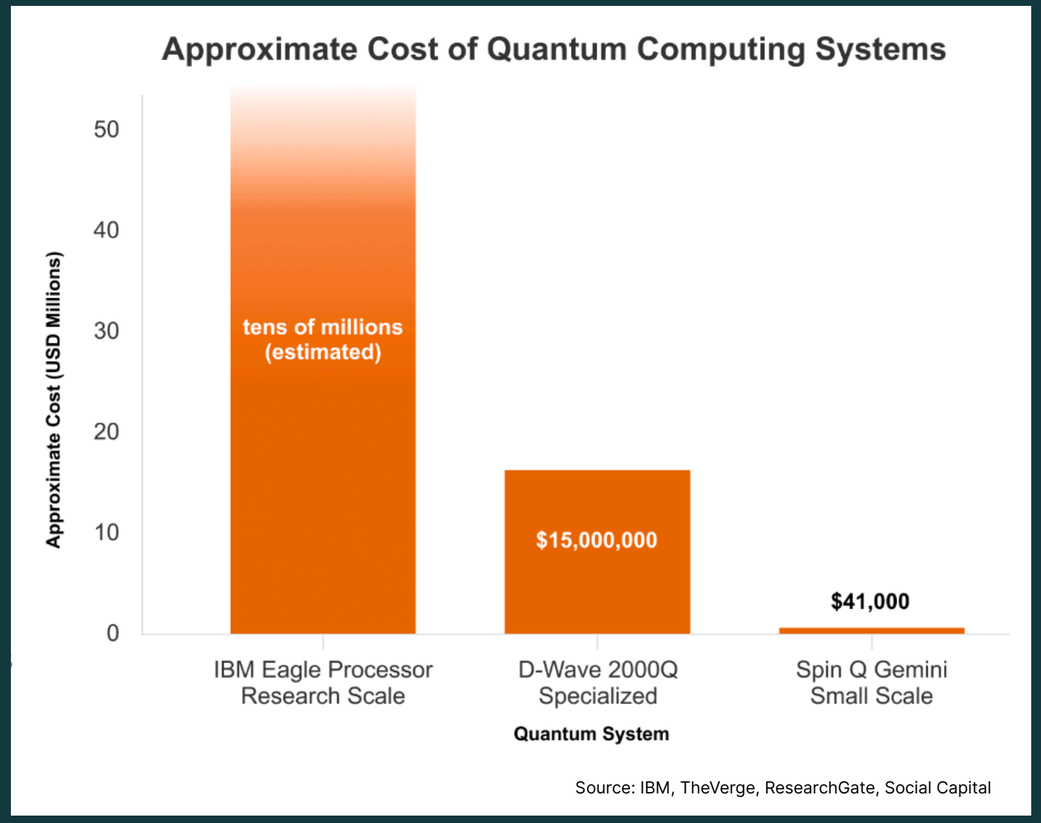
Q: How should investors think about the timeline?
A: As long as quantum use case testing continues there's a viable market with private exits before the science fully proves out.

Q: How should investors position in this space?
A: Pair early-stage investments with government or university research funding. Beyond solving for the science-related challenges, focus on companies enabling ongoing quantum testing, even if rudimentary.

Read entire *Expert View* on meetperry.com

Commercialization: The cost of current quantum computing systems doesn't scale ... yet

IBM is currently targeting ~200 logical qubits by 2029 and, if those trajectories hold, 1,000+ logical qubits could arrive in the 2030s. That's enough to begin solving real problems in chemistry, optimization, and AI training.



Source: IBM, TheVerge, ResearchGate, Social Capital

The current quantum price tag is steep

- Rare materials required: Ytterbium-171 isotopes, Beryllium ions, ultra-pure niobium
- Dilution refrigerators cost millions and cool systems to 15 millikelvin — colder than deep space
- Current systems range from $41K (small-scale) to tens of millions (research-grade)
- Scaling to millions of qubits will require supply chains and infrastructure that don't exist yet

But the question is no longer ‘is it possible?’ but when it will scale to commercial viability.

Summary Checklist

- **Validated:** Nobel Prize science & Google Willow engineering.
- **Funded:** Record capital inflows & government mandates.
- **Necessary:** The way to solve problems in drug discovery, climate, and security.

Join us! Members can explore our Quantum Computing programming throughout 2026.

ELEVATE IN-PERSON EVENTS

Friday, March 27 in Los Angeles
DARPA
Dr. Joe Altepeter, Program Manager

Thursday, May 21 in Austin
Strangeworks
William Hurley, Founder & CEO

THEMATIC VIRTUAL SESSIONS

Tuesday, March 3
Strangeworks
William Hurley, Founder & CEO

Tuesday, March 10
Ghalbouni Consulting
Joe Ghalbouni, Founder and President

Tuesday, March 17
IBM
Mark Hughes, Global Managing Partner, Cybersecurity Services

Tuesday, March 24
Differential Ventures
Nick Adams, Managing Partner
David Magerman, Managing Partner

Tuesday, March 31
Quantum Strategy Institute
Brian Lenahan, Founder & Chair

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