Infographic

Quantum Computing Cyber Risk

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Q-Day

The period when quantum computers can break standard encryption: a window, not a date

THE WALL STREET JOURNAL.

Why Quantum Computing Is a Threat to Cybersecurity

The math behind standard encryption will be no match for quantum computers, forcing organizations to rethink cybersecurity.

Quantum Cyber Resilience

- **Lattice-Based Cryptography:** Designed to resist attacks from both classical and quantum computers.
- **Hybrid Approach:** Combines classical and Post-Quantum Cryptography (PQC) to support a secure transition during migration.
- **Hamming Quasi-Cyclic (HQC):** A code-based Key Encapsulation Mechanism (KEM) selected by NIST as an additional backup algorithm.

Quantum Readiness

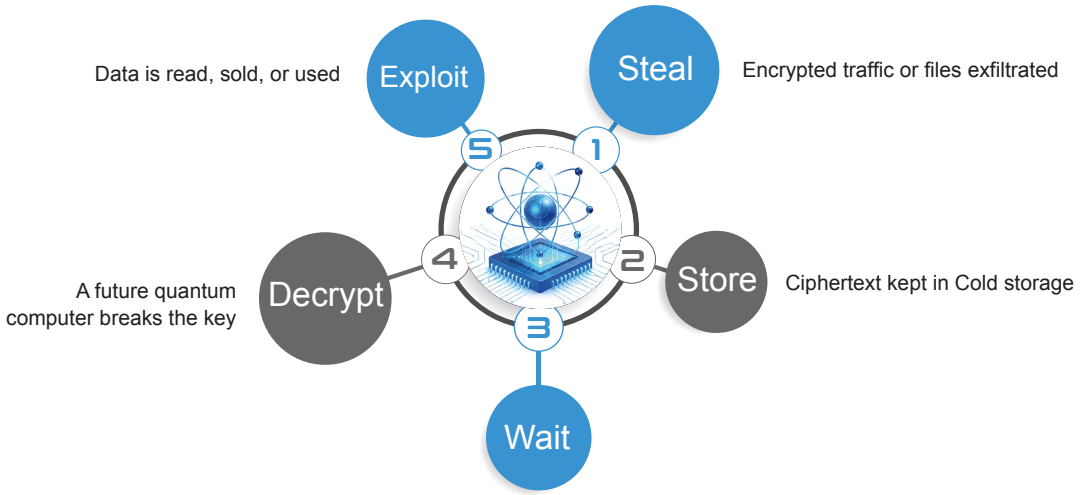
- Build a quantum-readiness roadmap.
- Inventory all cryptographic assets across apps, hardware, and vendors.
- Prioritize high-risk data and systems.
- Engage vendors on PQC plans early.
- Pilot hybrid cryptography before rollout.
- Build crypto-agility for future swaps.

Quantum Threat

- Quantum computers solve certain math problems far faster than classical ones.
- Shor's algorithm can factor large numbers, breaking RSA, Diffie-Hellman, and ECC.
- Broken cryptography could enable fake digital signatures and undermine trust.

Harvest-Now, Decrypt-Later

- Attackers steal encrypted data now, hoping to decrypt it later.
- Long-lived data - IP, health records, government intel — is most exposed.



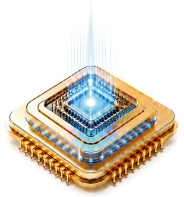
Quantum computing matures over years

Data Intercepted or stolen now can remain a liability for years before it is ever decrypted.

Global AI Cyber Defense Thought Leader

Infographic

Quantum Computing Cyber Risk



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Key Timeline

2029
IBM targets commercial fault-tolerant quantum systems; Google, Microsoft, Cloudflare target full PQC migration

2030
Federal high-value assets migrated for **key establishment**; contractor PQC regulations issued; NIST begins deprecating RSA-2048

2031
Federal high-value assets migrated for **digital signatures**

2035
NIST target for full phase-out of legacy public-key algorithms

Source Quantum Computing Cybersecurity Preparedness Act (6 USC §1526); Executive Order "Securing the Nation Against Advanced Cryptographic Attacks," June 22, 2026.

NIST Quantum Standards

Standard	Algorithm	Purpose
FIPS 203	ML-KEM (CRYSTALS-Kyber)	Key encapsulation / encryption
FIPS 204	ML-DSA (CRYSTALS-Dilithium)	Digital signatures
FIPS 205	SLH-DSA (SPHINCS+)	Backup hash-based signatures
FIPS 206 (Draft)	FN-DSA (FALCON)	Compact signatures for constrained devices

Acronyms

CISA Cybersecurity & Infrastructure Security Agency

ECC Elliptic Curve Cryptography

FN-DSA NTRU-Lattice Signatures (FALCON, draft FIPS 206)

HQC Hamming Quasi-Cyclic backup KEM

HNDL Harvest-Now, Decrypt-Later

HSM Hardware Security Module

IAM Identity and Access Management

KEM Key Encapsulation Mechanism

ML-DSA Module-Lattice Signatures (Dilithium)

ML-KEM Module-Lattice KEM (Kyber)

PQC Post-Quantum Cryptography

Q-Day Day quantum computers break standard encryption

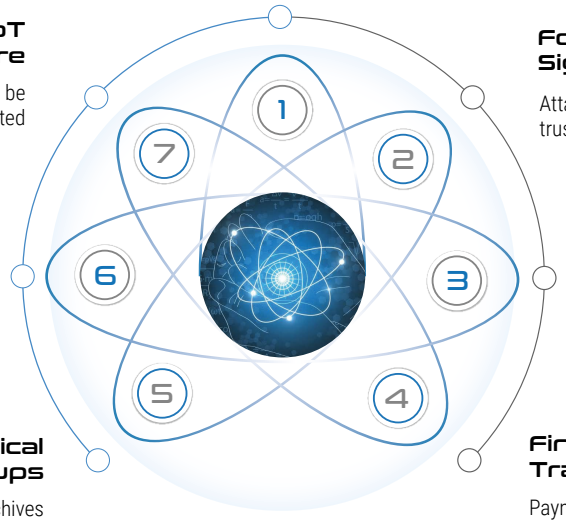
RSA Rivest Shamir Adleman

SLH-DSA Stateless Hash-Based Signatures (SPHINCS+)

91% of security pros lack a formal quantum roadmap.

Harvest-Now Decrypt-Later

Stolen data decrypted once quantum matures



Legacy IoT Exposure
Old devices can't be updated

Forged Digital Signatures
Attackers impersonate trusted vendors/software

IAM/Certificate Failure
Attackers impersonate identities

Secure Boot Compromise
Firmware trust checks bypassed

Exposed Historical Backups
Old encrypted archives become readable

Financial Transaction Risk
Payment and ledger integrity threatened

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