HPC and Modern Cryptography: The Race Against Quantum

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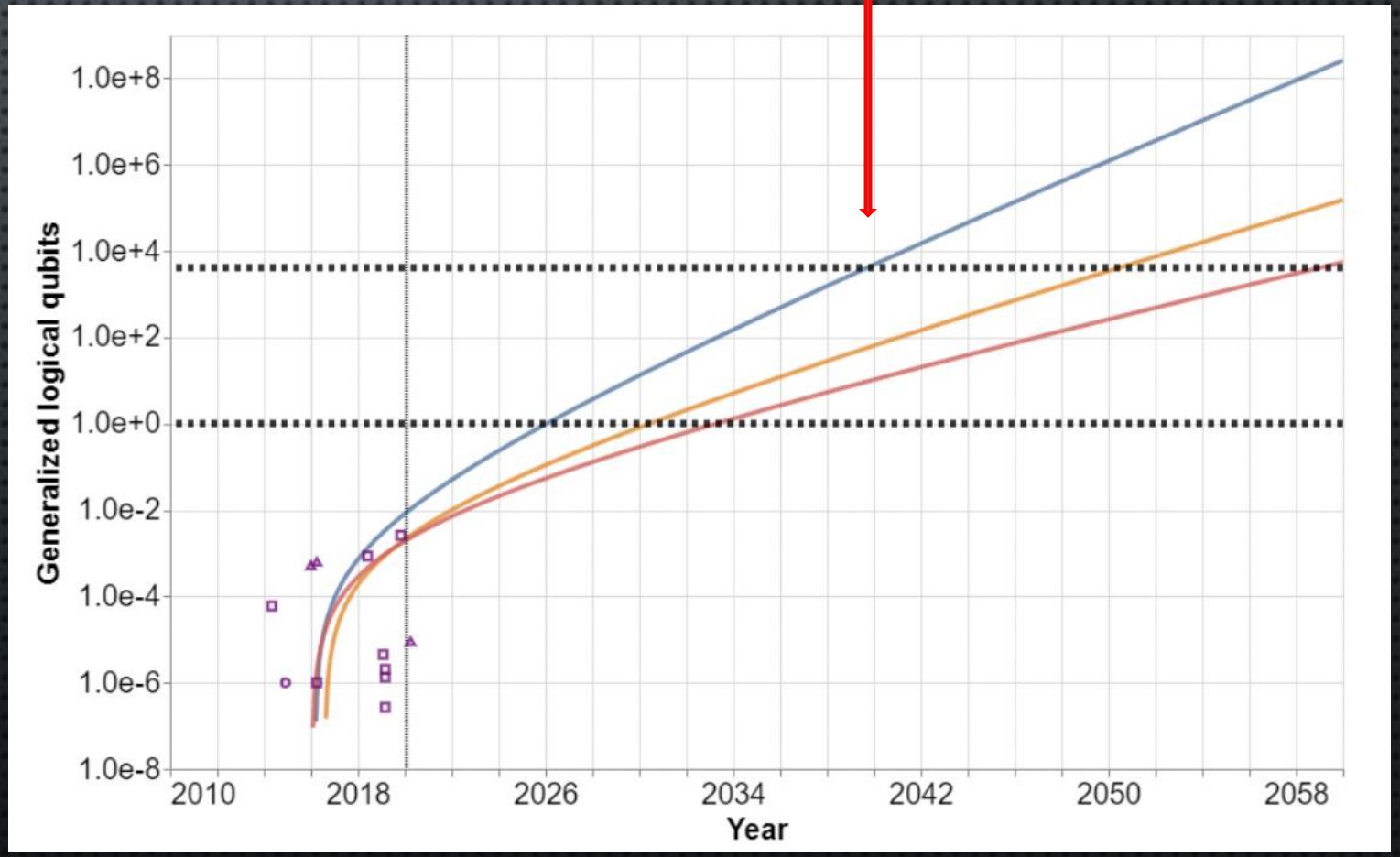
YOUR SECRETS HAVE AN EXPIRATION DATE

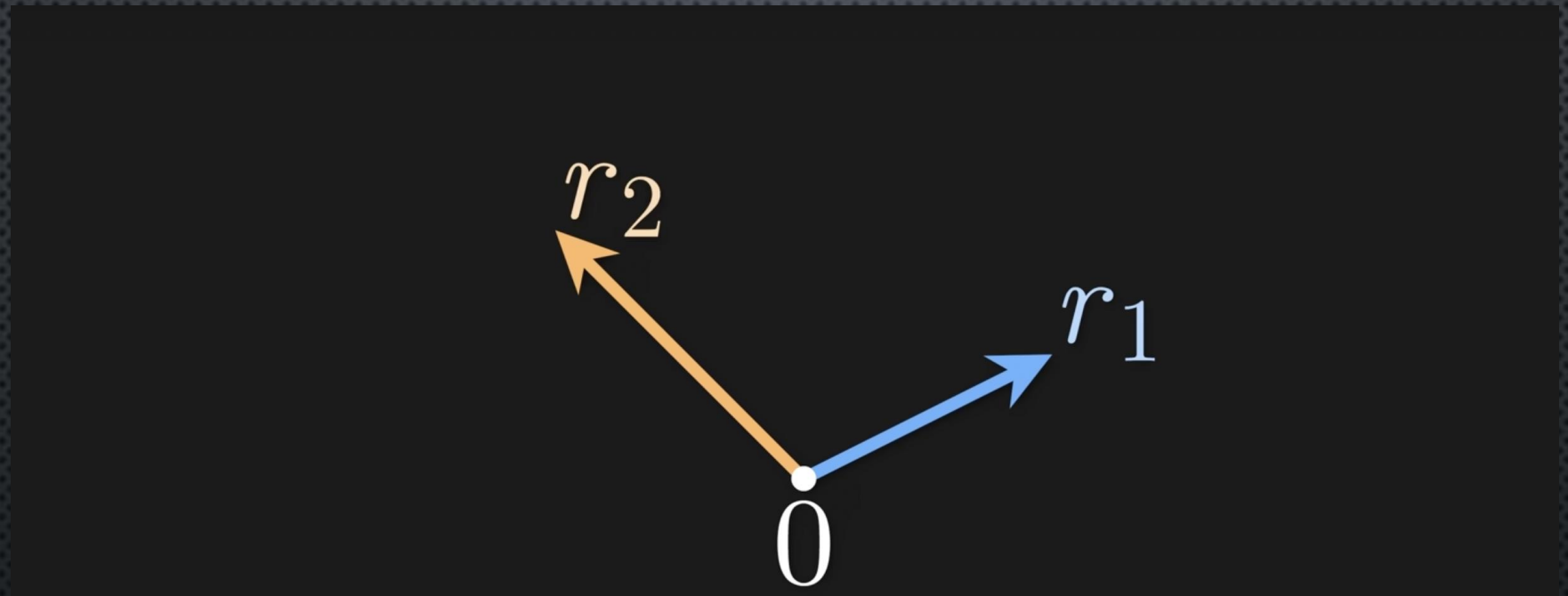
THE QUANTUM THREAT TO CLASSICAL CRYPTOGRAPHY

Shor's Algorithm:
RSA / Diffie-Hellman

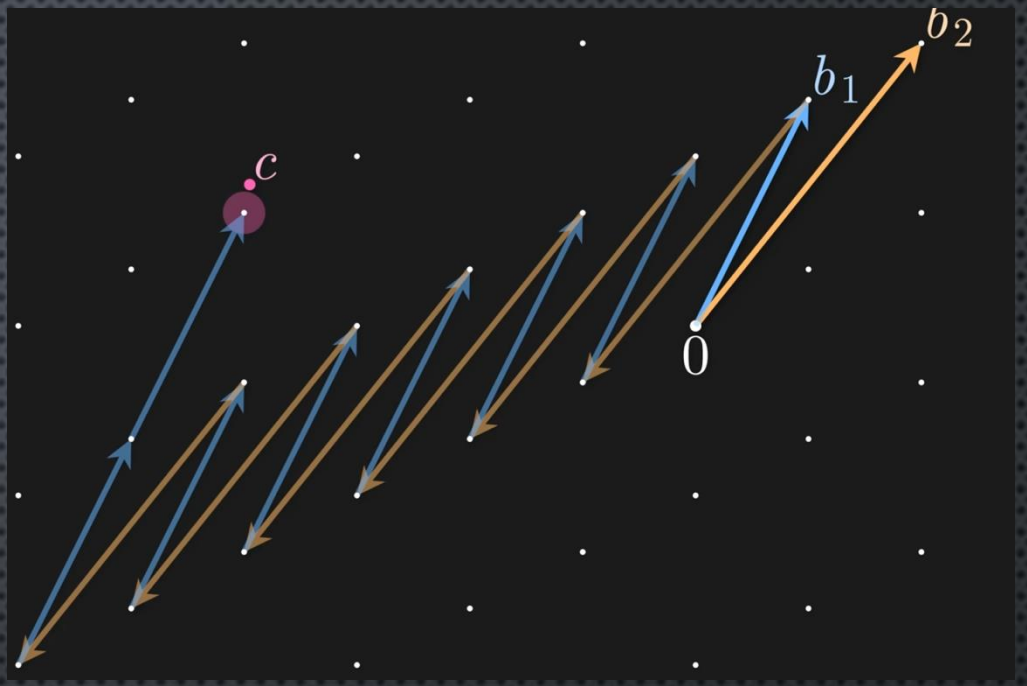
Grover's Algorithm:
AES-128

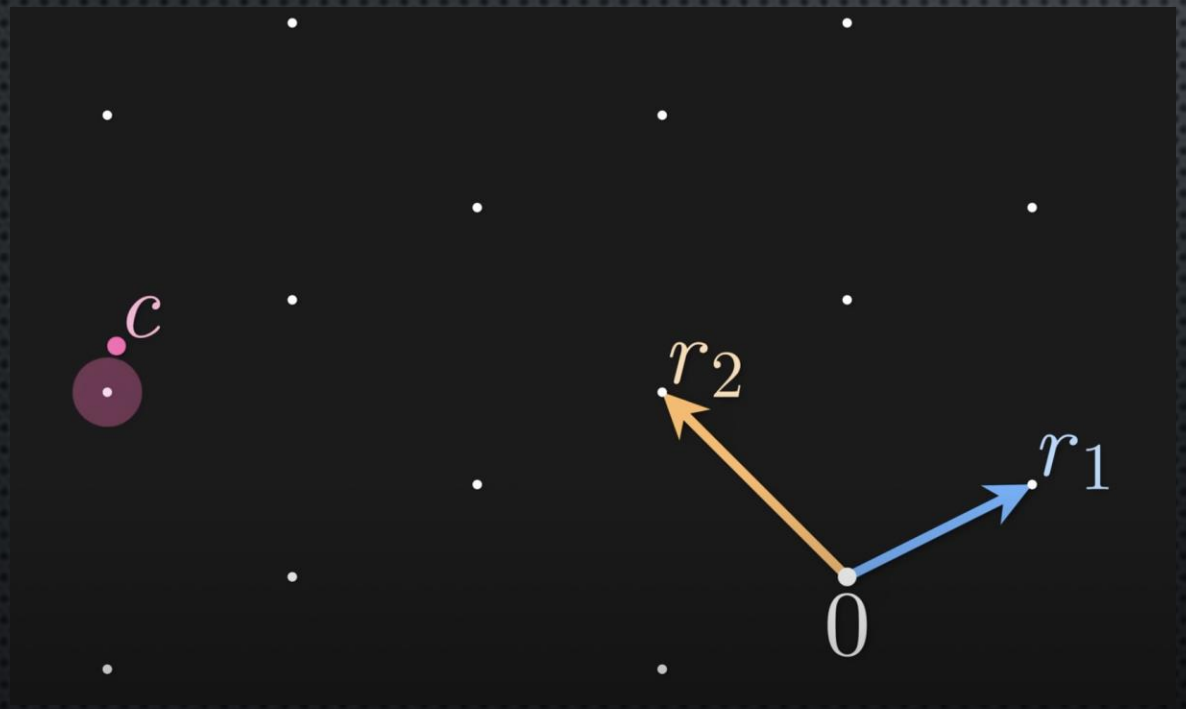


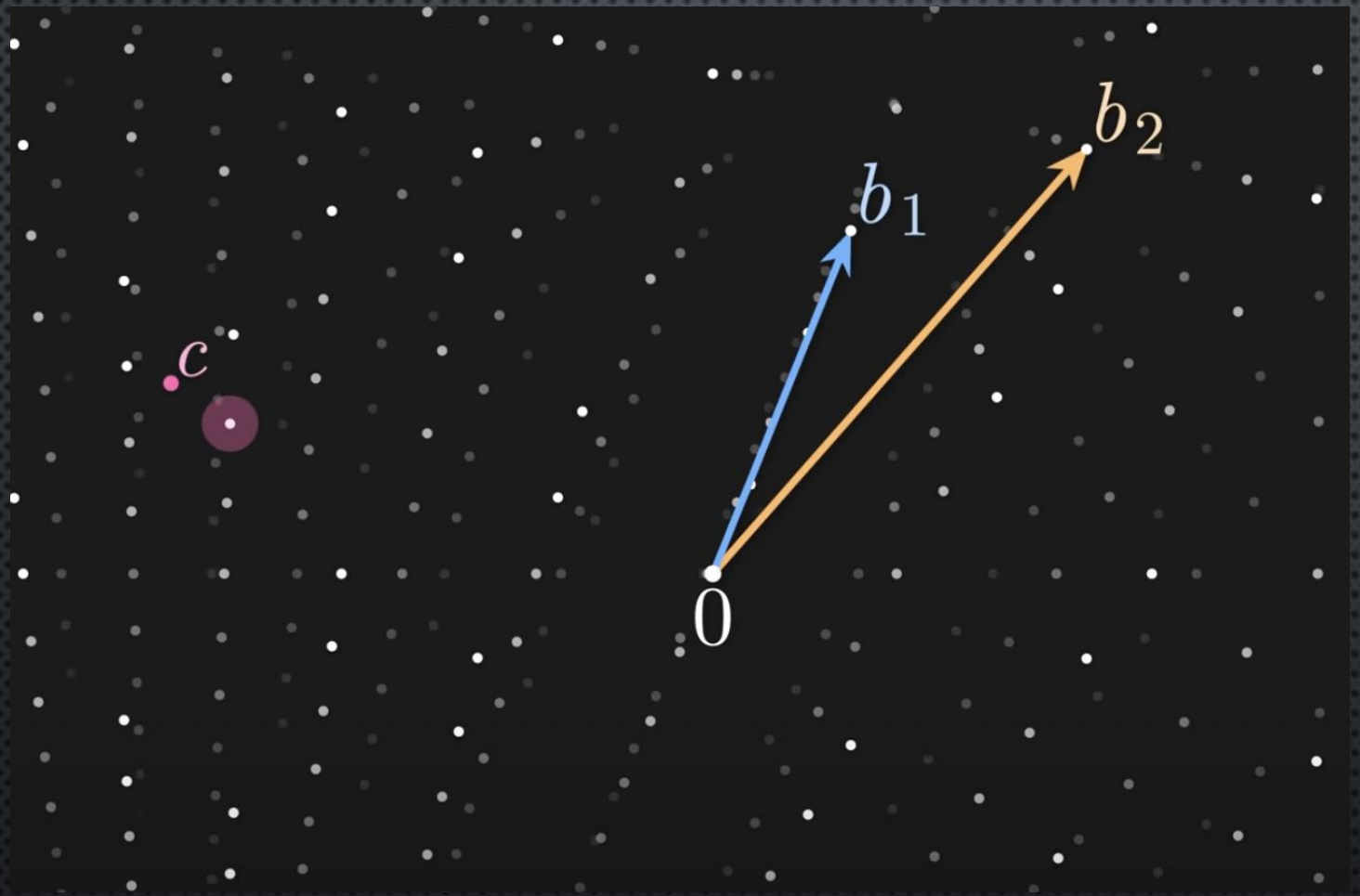
LATTICE-BASED CRYPTOGRAPHY



One application: CVP (Closest vector)







How do you know you have the closest point? You must check everything exhaustively!

Where does HPC come in? Security benchmarks

- Most computers can solve up to 200 dimensions, HPC can go to 900+
- Cryptanalysis algorithms targeting SVP/CVP: Lattice Reduction (LLL, BKZ)
- Direct solving (Enumeration, Sieving)

Performance challenges: implementation-dependent, memory-intensive

DISCUSSION

- – LUSA
- – NIST
- – INCREASE HARDWARE, INCREASE QUBITS
- – SECURE ENCRYPTION

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