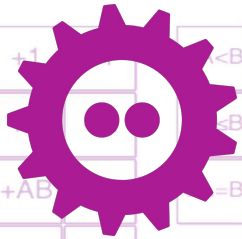
Welcome!
Quantum Computing devroom

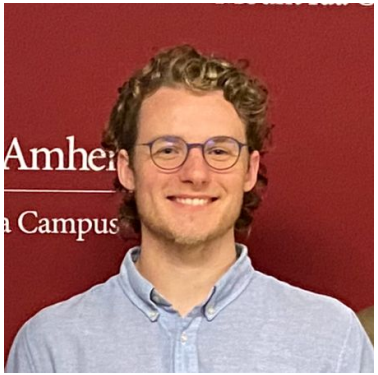
FOSDEM 2025



|organizers>

Alessandro Cosentino

nate stemen



Purva Thakre

Unitary Foundation

unitary.foundation

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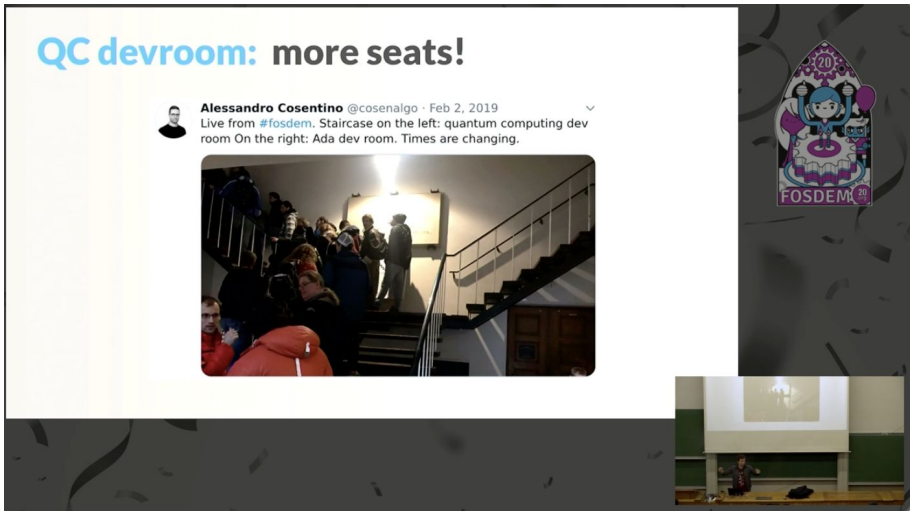
|devroom history>

- 2 editions in the past: 2019 and 2020
- Organized by the Quantum Open Source Foundation (QOSF)
- Tomas Babej and Mark Fingerhuth
- 4 years hiatus since then



|outline⟩

- |quantum computing⟩
- |quantum computing *software*⟩
- |quantum computing **open source** *software*⟩
- |quantum computing **open source** *software*⟩at FOSDEM

|quantum computing⟩

A paradigm that harnesses properties of quantum mechanics – such as superposition, entanglement, and interference – to fundamentally improve the speed and/or security of computers

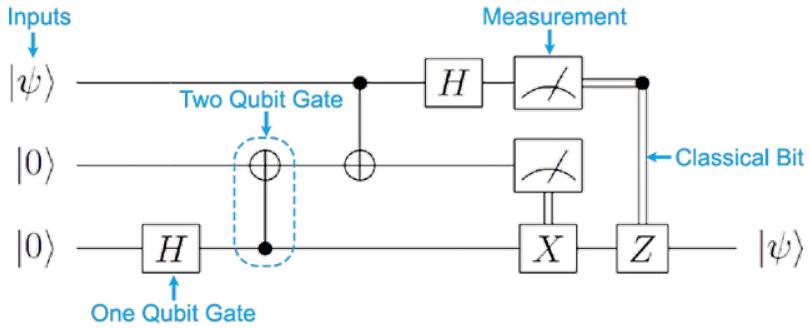
⚙️ An area of research for 20 years; feasibility in the coming 20 years 🤞

📍 In the NISQ (noisy intermediate-scale quantum) era – up to 1,000 qubits

🔓 Applications:

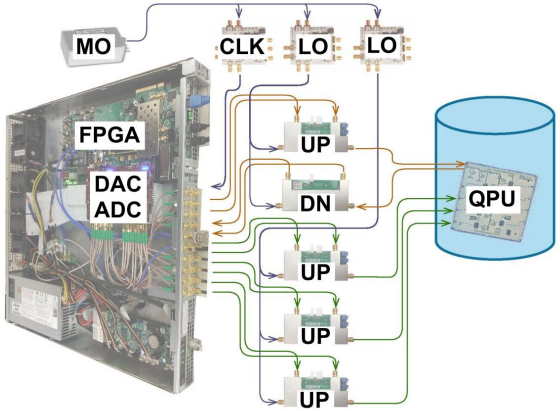
- **Cryptography:** compute the secret key from the public key of the RSA scheme
- **Simulation of quantum systems:** design new materials, more efficient fertilizers, new drugs
- **Optimization:** routing, scheduling, etc…

|quantum computing *software*⟩



the job

1. Comes up with an algorithm/protocol
2. Writes it in a formal language
3. Compiles
4. Simulates on classical devices
5. Runs on real hardware devices

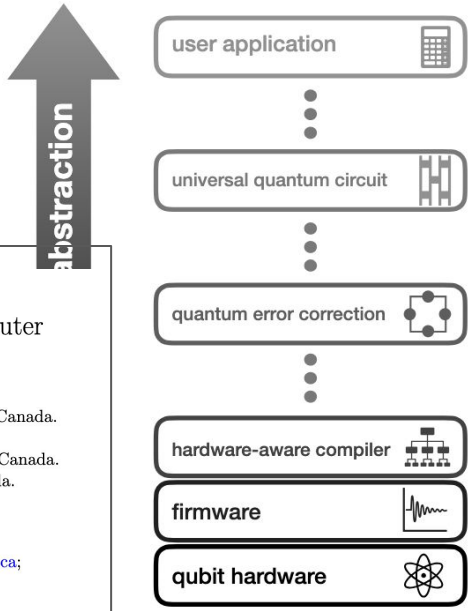


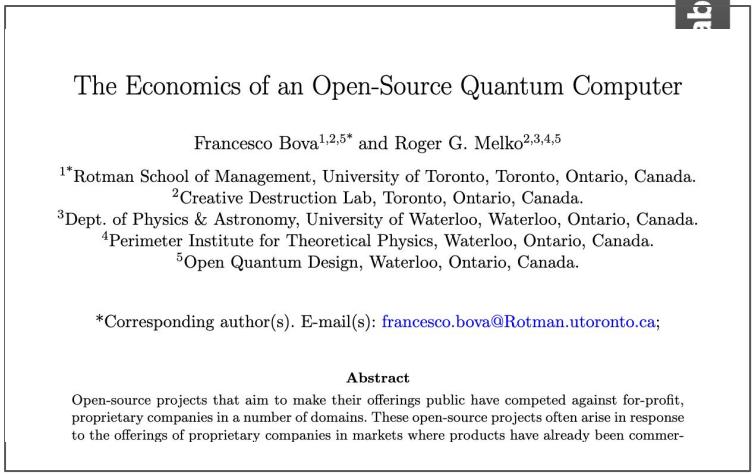
tools for the job

1. Hybrid approach (error mitigation, variational quantum algorithms)
2. Domain-specific languages
3. Compilers
4. Simulators
5. Control toolkits

|quantum computing **open source** *software*⟩

- R&D phase
- No single “correct” approach yet
- Transparency: benchmark and verify claims
- Truly full-stack





The Economics of an Open-Source Quantum Computer

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Abstract

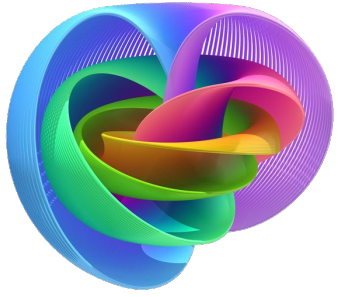
Open-source projects that aim to make their offerings public have competed against for-profit, proprietary companies in a number of domains. These open-source projects often arise in response to the offerings of proprietary companies in markets where products have already been commer-

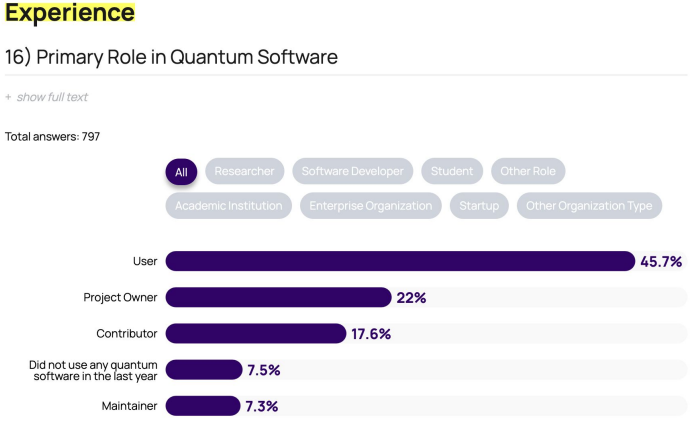
https://arxiv.org/abs/2501.13315v1

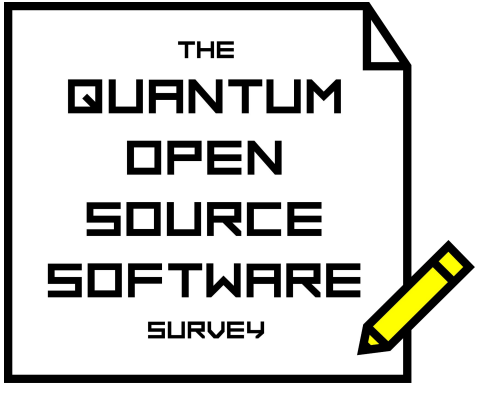
|QOSS: landscape⟩

github.com/qosf/awesome-quantum-software (400+ project)

unitaryfund.github.io/survey-2024/ (800+ participants)







|schedule⟩

Welcome to the Quantum Computing devroom	Alessandro Cosentino	13:10	13:20
Qlafoutea: Baby steps towards compiling a programming language to analog quantum computer	David "Yoric" Teller	13:25	13:45
No-one used my software: a tale of quantum software engineering	Aleksander Wennersteen	13:50	14:10
Bridging the Gap: Quantum Computing for Classical Software Engineers	Veronica Lopez	14:15	14:35
Quantum type system in H-hat quantum programming language	Eduardo Maschio (Dooms)	14:40	15:00
Quantum Distance Bounding: Unlocking Secure Proximity	Kevin Bogner	15:05	15:25
Introducing Qumat! (An Apache Mahout Joint)	Trevor Grant, Andrew Musselman	15:30	15:50
Opensource Tools for Platform Agnostic Quantum Computing	Harshit Gupta	15:55	16:15
On-Chip Verified Quantum Computation with an Ion-Trap Quantum Processing Unit	Cica Gustiani	16:20	16:40
Unitary Compiler Collection	nate stemen	16:45	17:00

|thanks!⟩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