Rutgers QEC & Beyond

SEASON 4 / TALK 2 FALL 2026 / ONLINE

#39 SERIES TALK

C-Phase-Aware Compilation for Efficient Fault-Tolerant Quantum Execution

WEDNESDAY, NOVEMBER 04, 2026

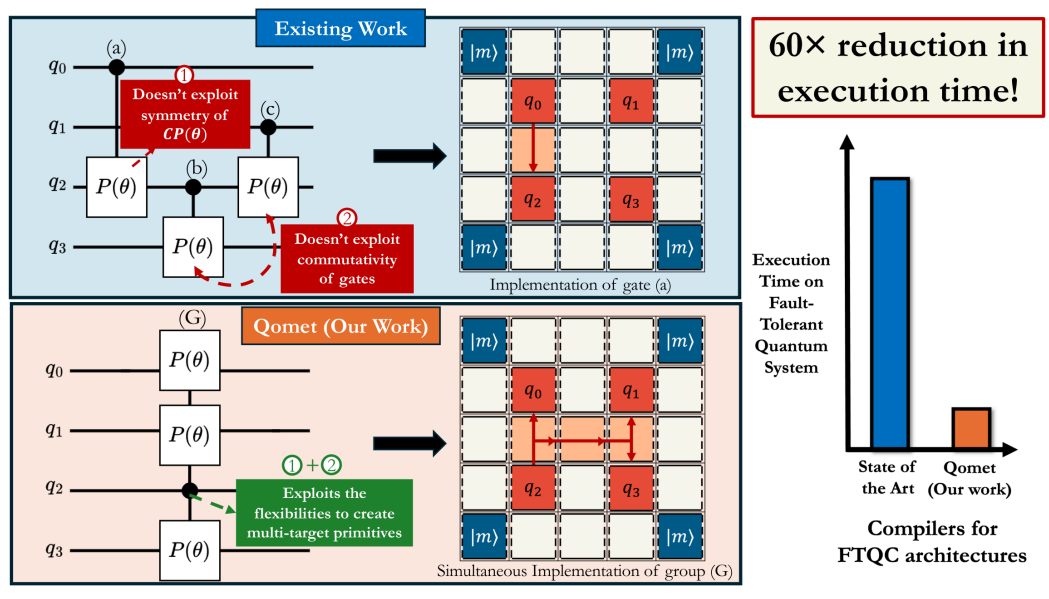
2:00-3:00 PM EST / 1:00-2:00 PM CST

ABSTRACT

Achieving practical quantum advantage on fault-tolerant quantum computers (FTQC) is fundamentally constrained by the substantial spatial and temporal overheads required to map logical operations onto physical hardware. Existing compilation approaches typically adopt coarse-grained, slice-based abstractions that overlook fine-grained microarchitectural effects, such as routing contention, leading to inefficient resource utilization and limited alignment between algorithm structure and hardware capabilities.

We introduce Qomet, a microarchitecture-aware compiler that tightly couples algorithmic properties with lattice surgery (LS) execution. By exploiting C-Phase gate commutativity, Qomet translates sequential operations into simultaneous multi-target interactions, natively leveraging LS to eliminate false dependencies and expose instruction-level parallelism. To support this, Qomet employs an adaptive, event-driven scheduler that captures precise spatial and routing constraints to overlap instructions temporally. By minimizing grid idling and routing contention, Qomet achieves a geometric-mean execution speedup of 4.29× and a maximum speedup of 59.7× across realistic workloads.

Qomet / MICROARCHITECTURE-AWARE COMPILATION



Join on Zoom

ID: 310 531 8007

Passcode: Z7pfaQ

ABOUT THE SPEAKER



Dhanvi Bharadwaj

University of Michigan

Dhanvi is a 3rd-year PhD candidate at the University of Michigan researching quantum computing architecture with Prof. Gokul Ravi. He specializes in hardware-software co-design for QEC and is currently focusing on compilation for fault-tolerant quantum computers. Dhanvi has also worked on teams across the quantum stack at Infleqtion, NVIDIA, qBraid, and Oak Ridge National Lab.

Supported by FINQ