Quantum computing communities

The Munich Quantum Valley project

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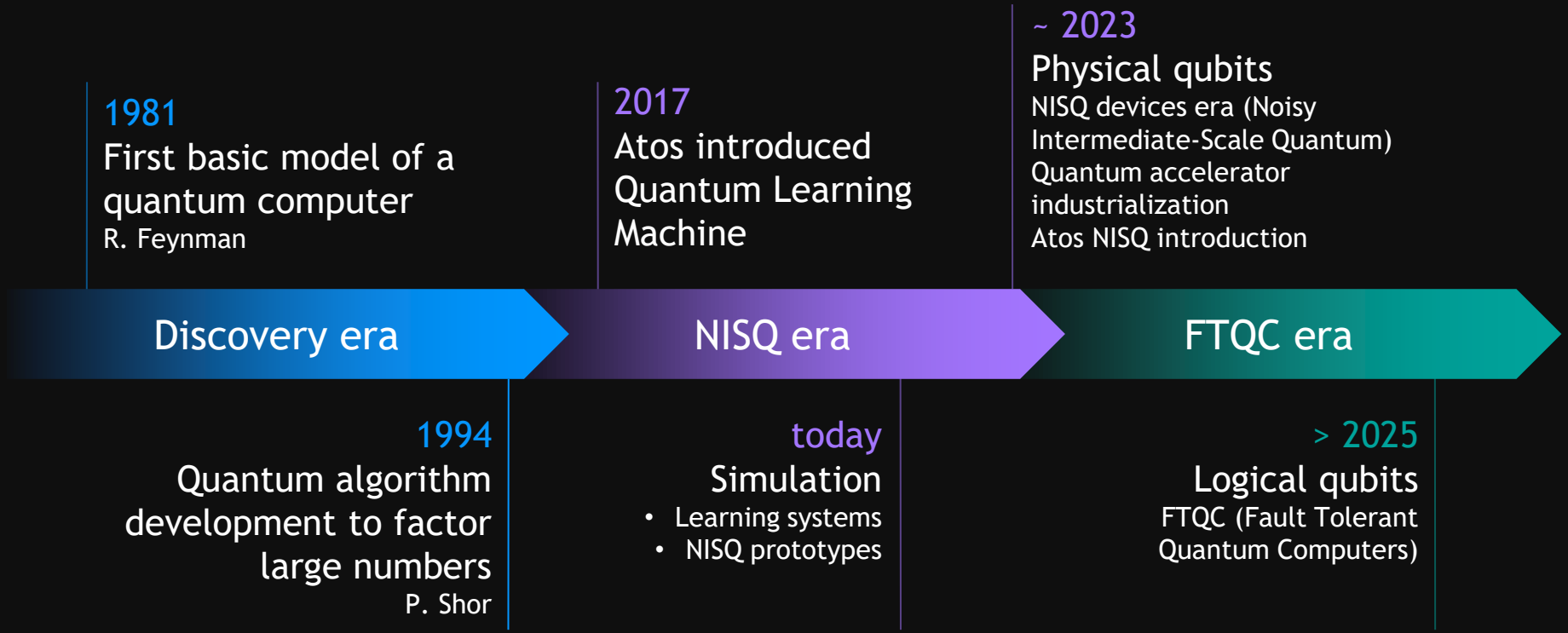
Agenda

1. Quantum Computing Introduction
2. How to build a Quantum community
3. The Munich Quantum Valley project
4. Atos Quantum Program

1. Quantum computing introduction

A brief history



1. Quantum computing introduction

Fundamental notions

Qubit

- Basic unit of quantum information
- In quantum computing, computational power is related to the number of qubits
- N qubits = 2^N information bits

Superposition and Measurement

Qubits can be superposed

When measured, they collapse to one of the states: |0> or |1>

Quantum entanglement

Entangled qubits interact with each other. They cannot be described independently, but they become a whole new state.

Measuring one qubit, influence the entire entangled system!

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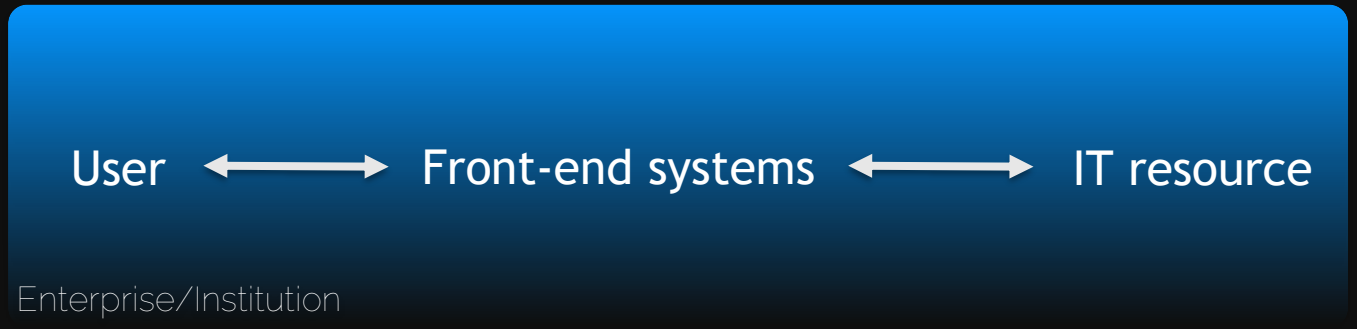
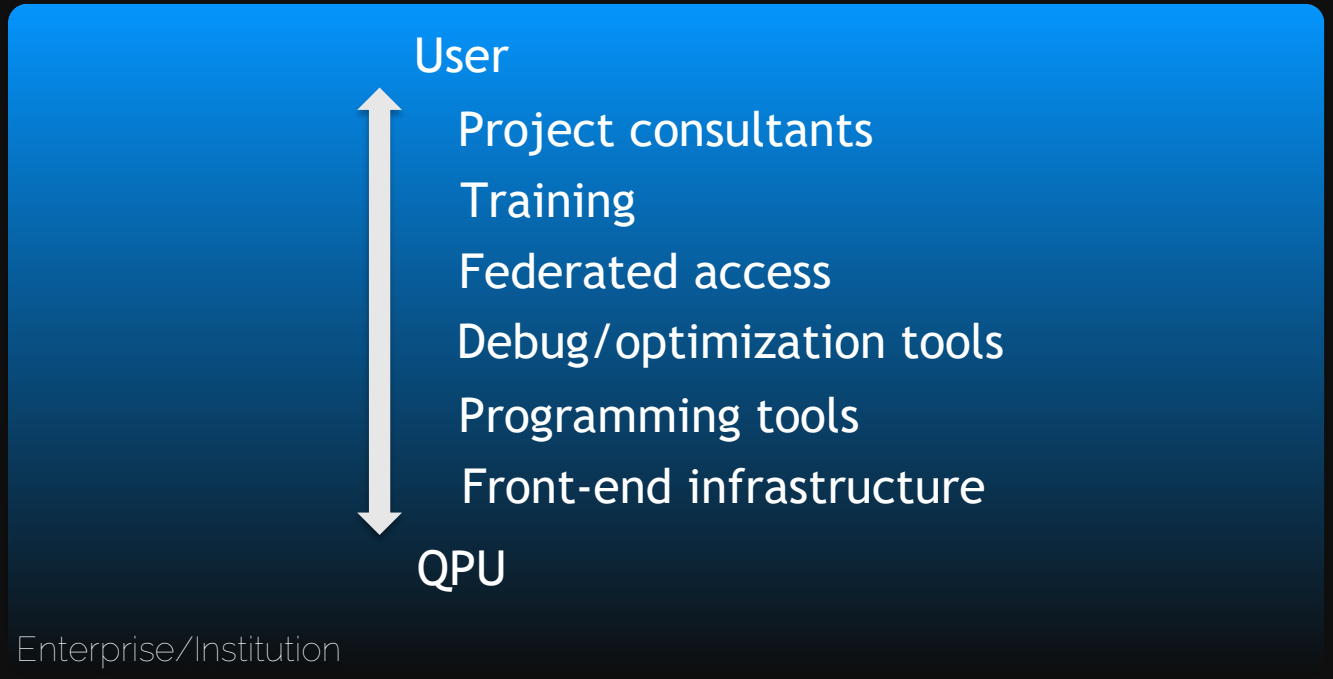
2. How to build a quantum community

Standard approach: QPU as just another IT resource



2. How to build a quantum community

Advanced approach: a specific computing resource for researchers



2. How to build a quantum community

Different user profiles → Different services

Profile	Basic training	Advanced training	Academic training	Computing resources (off-prem)	Computing resources (on-prem/cloud)
Senior researcher	✓	✓		✓	✓
Junior researcher / PhD	✓	✓	✓	✓	✓
Graduate student	✓		✓	✓	
Private sector partner	✓			✓	✓

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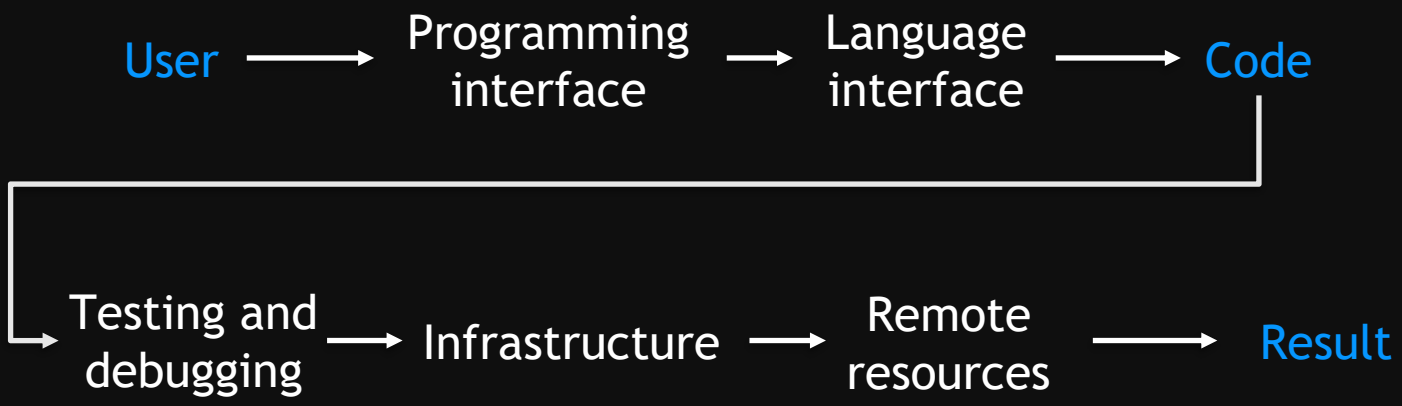
2. How to build a quantum community

Quantum programming workflow



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3. The Munich Quantum Valley project

An association to develop Quantum technologies

Munich Quantum Valley

Accelerate the translation of scientific findings into practical products and promotion of Quantum technologies

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3. The Munich Quantum Valley project

A three points view

Quantum computing and technologies Center

Base research

Develop, build and operate custom-made quantum computers

Technology transfer to industry

Quantum technology park

Provisioning of tools, labs and resources to researchers and startups

Qualification and training

Network of academic scientists

Training programs for industry

General public seeding projects

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3. The Munich Quantum Valley project

The research consortia

50+ academic research groups – 4 consortia

Hardware	Software	Firmware	Application

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4. Atos Quantum Program

Monitored by a top-class scientific advisory board

Atos has its quantum activities followed by the renowned scientists in the field:

- Artur Ekert (Hughes Medal)
- Alain Aspect (Wolf Prize)
- Serge Haroche (Nobel Prize)
- Daniel Esteve
- David Di Vincenzo

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4. Atos Quantum program

A universal gateway to quantum

Off-premise Desktop solution

myQLM

- Freeware
- Entry-level simulation
- Open-source plugins
- Scalability: ~20 qubits

On-premise solution

Atos QLM

- Advanced simulation
  - Noise modelling
  - Optimization
  - Quantum annealing
- Multi-tenancy
- Scalability: 40 qubits
- Optional GPU acceleration

Quantum Computing hardware

Connection to proprietary frameworks via Interop

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Questions?

Thank you

For more information please contact
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