



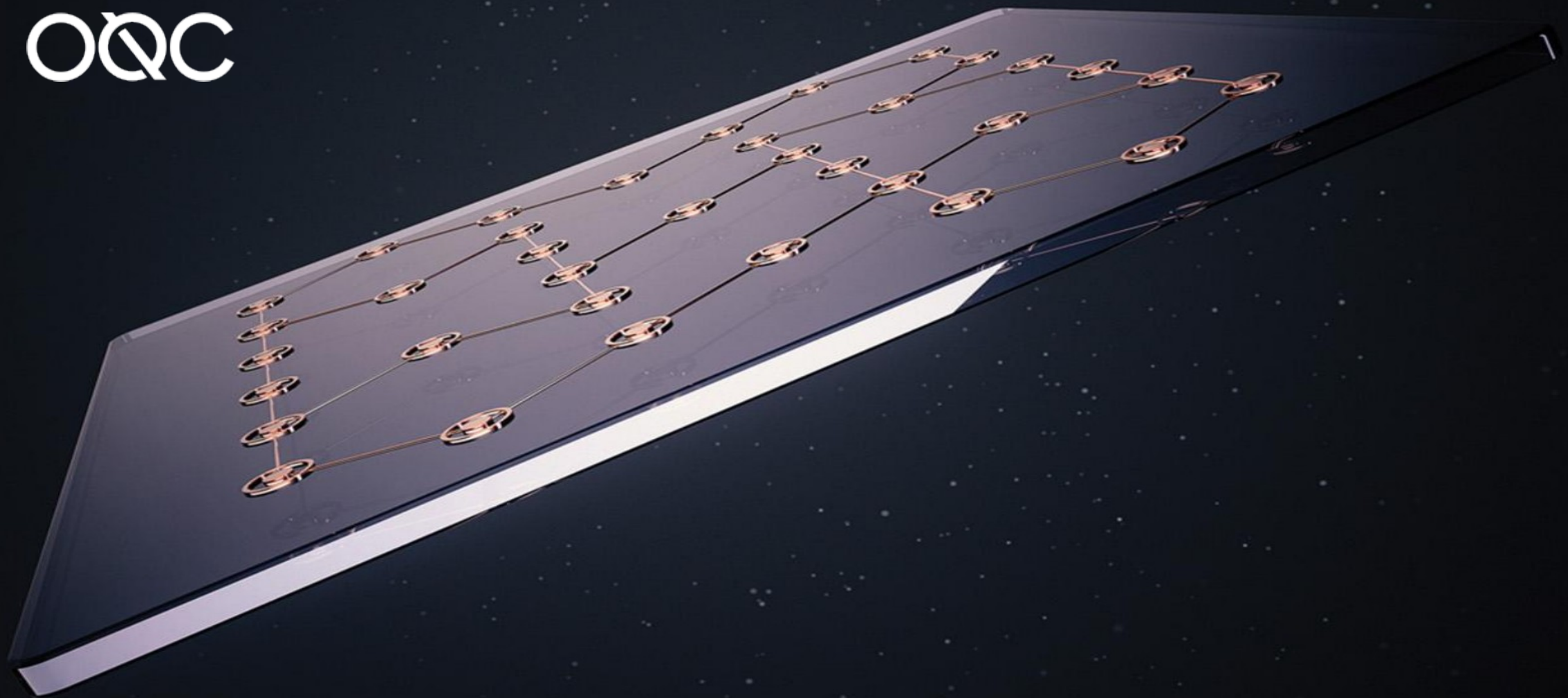
QMIO Quantum Computer

System Overview and Hands-On Tutorial

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IBERGRID 2024



QmIO >
OQC



Qmio QPU Specs

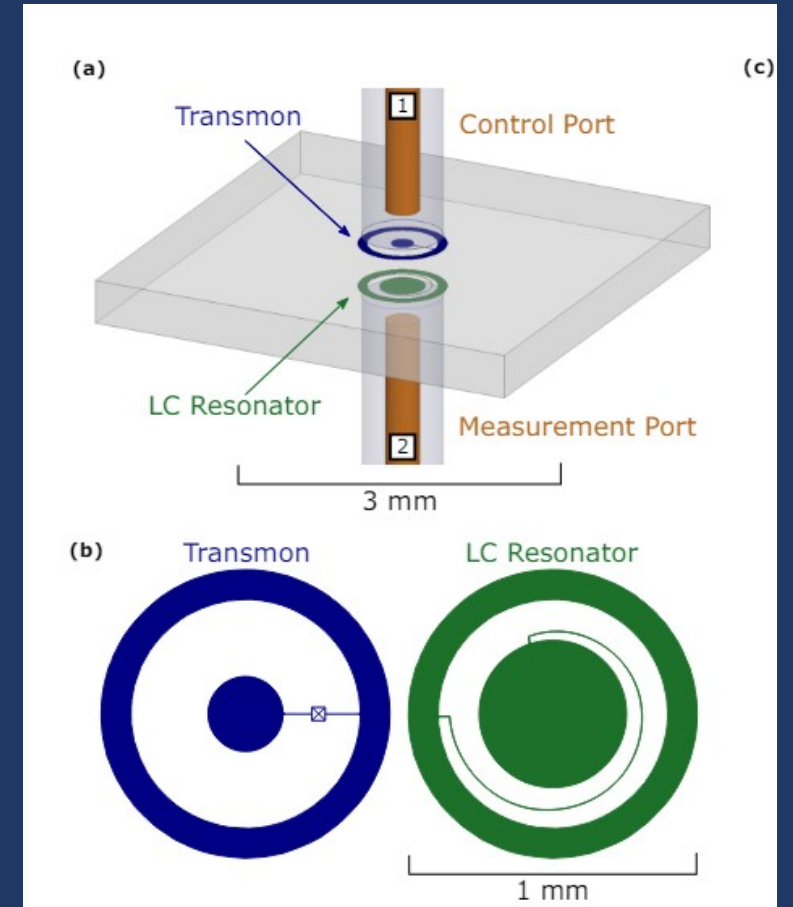
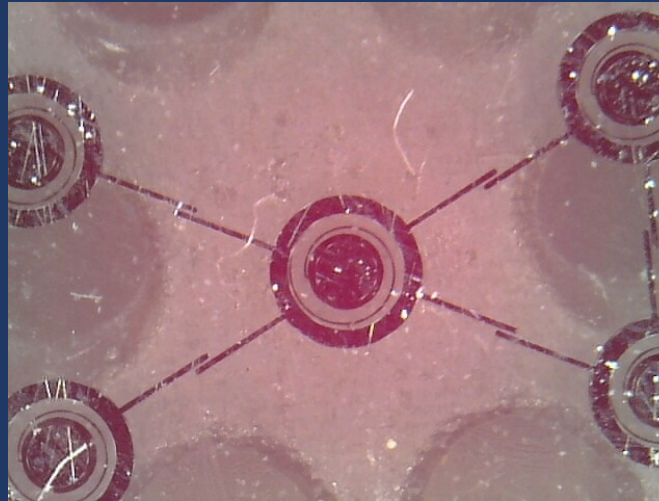
Qubits: 32 (35)

Qubit technology: **CoaxMon**

Native Gates:

1Q: RZ (virtual), SX

2Q: ECR (actually RZX($\pi/4$))



ArXiv:1703.05828

QPU Cooling

QPU Control

<40K

<4K

<1K

<100mK

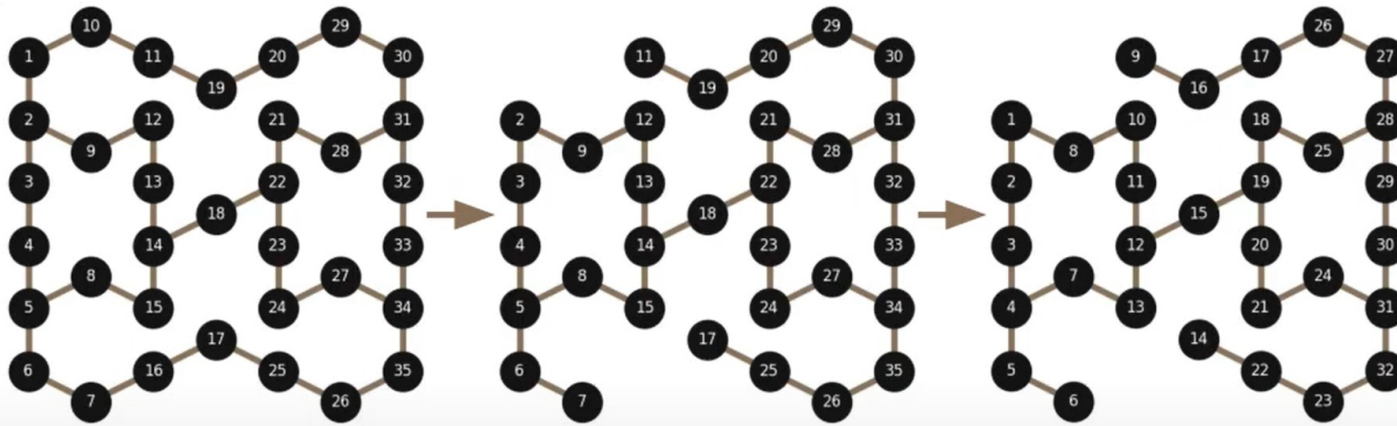
<20mK

QPU



Qmio QPU Topology

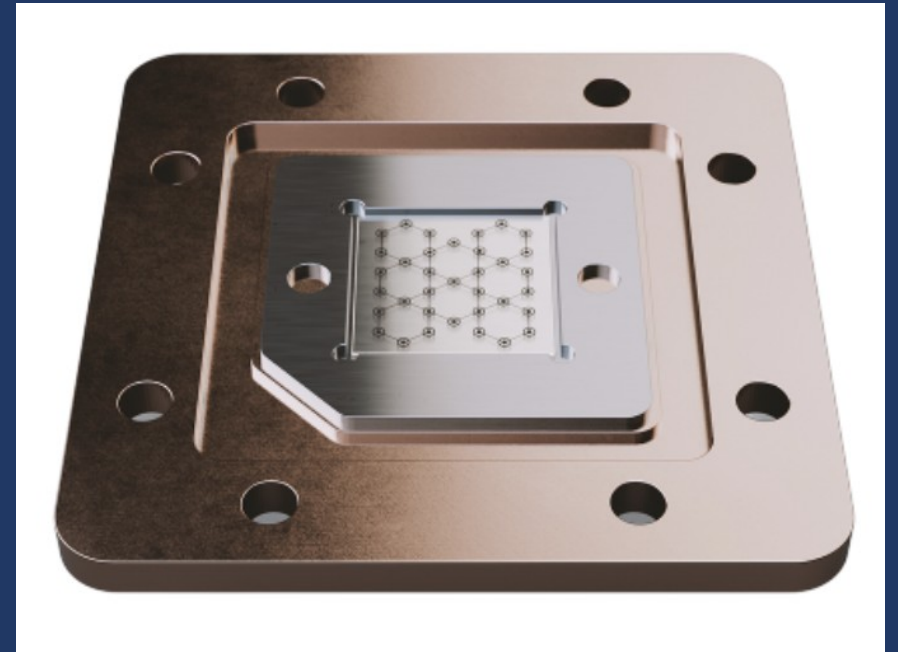
QPU Lattice at CESGA



Initial QPU with 3 redundant qubits

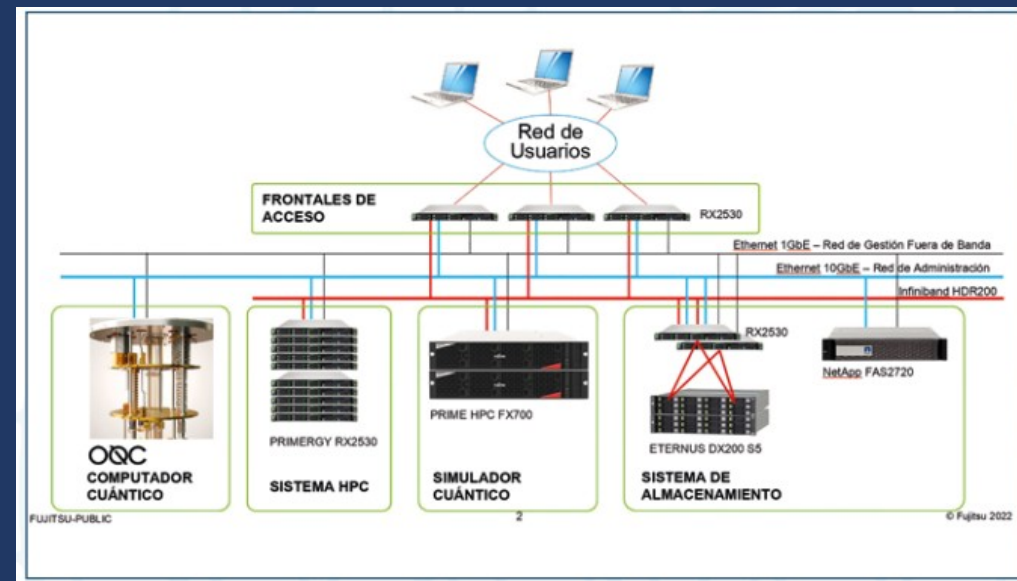
Choose the 32 best qubits

Relabel qubits sequentially



Source: <https://oqc.tech/tech/coaxmon/>

- o Computing infrastructure designed to research in Quantum Computing and Quantum inspired computing
- o It is composed of:
 - Quantum Processing Unig (QPU)
 - HPC System
 - Quantum Computer Emulator
 - Storage system
- o Access is granted through specific open calls

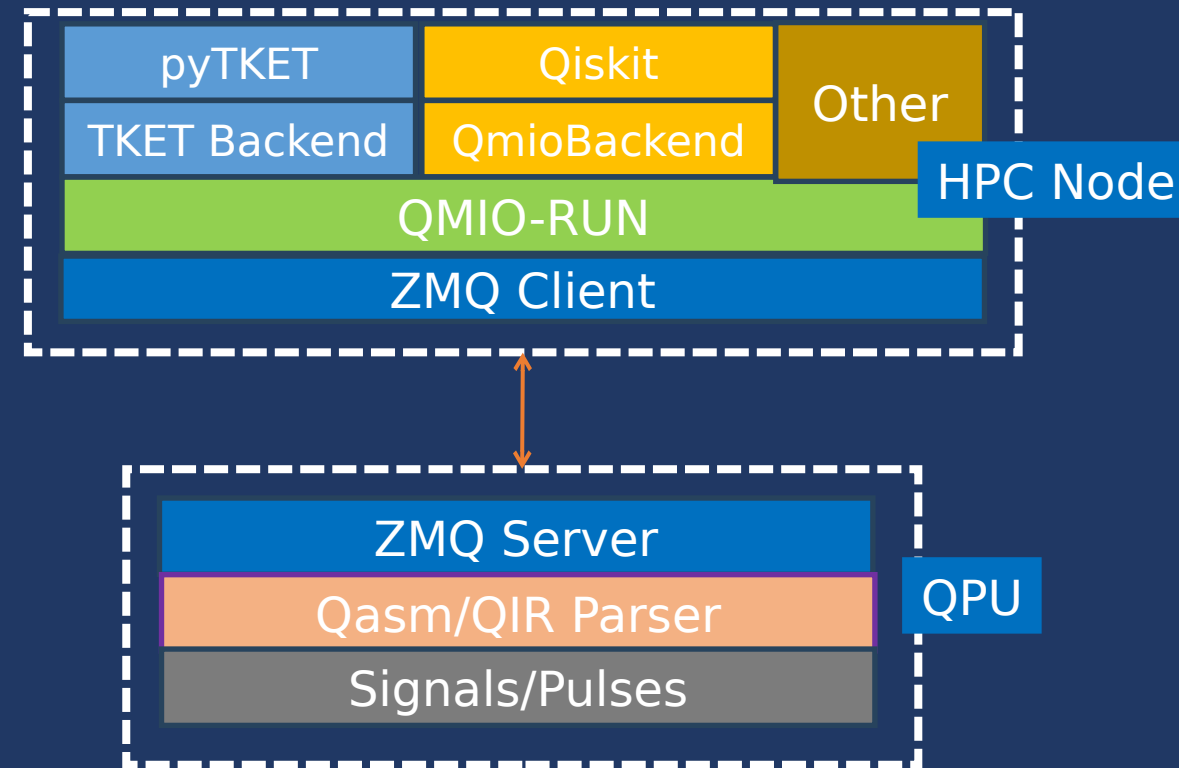


Calibration

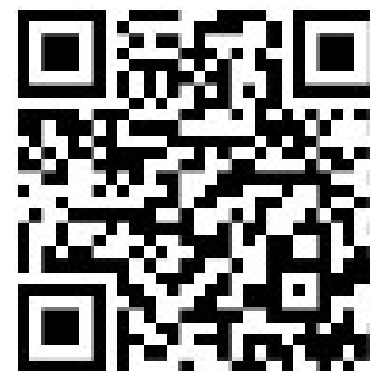
- Readout errors
- Crosstalk leakage



Integrating HPC & QPU



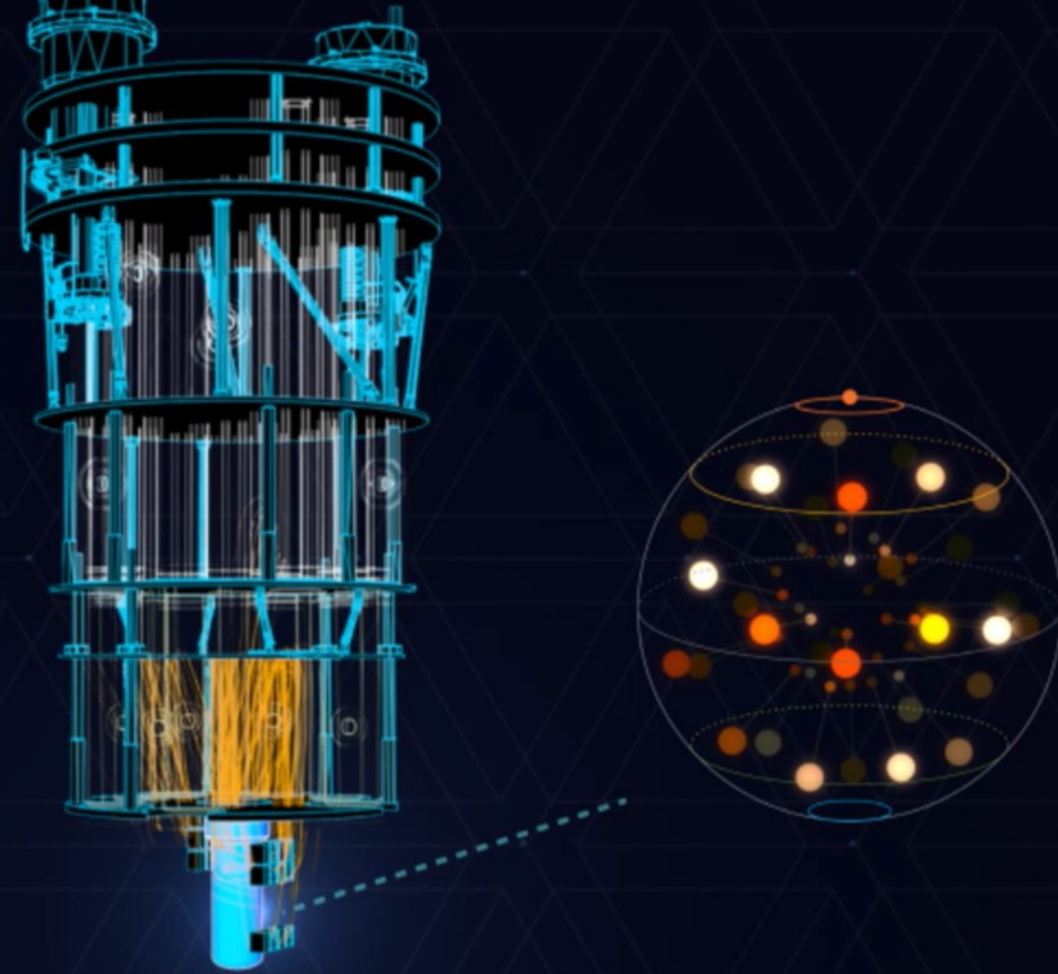
Download QMIO App



Qmio

Hands-on Tutorial

- You can find the material in:
- <https://github.com/javicacheiro/qmio-tutorial-ibergrid>



**DESPREGAMENTO DUNHA INFRAESTRUTURA BASEADA
EN TECNOLOXÍAS CUÁNTICAS DA INFORMACIÓN QUE
PERMITA IMPULSAR A I+D+i en GALICIA**

Apoiar a transición cara a unha economía dixital

**Operación financiada pola Unión Europea, a través do
FONDO EUROPEO DE DESENVOLVEMENTO REXIONAL (FEDER),
como parte da resposta da Unión á pandemia da COVID-19**

PROGRAMA OPERATIVO
FEDER GALICIA
2014-2020

Unha maneira de facer Europa



Qm10

Optional Slides

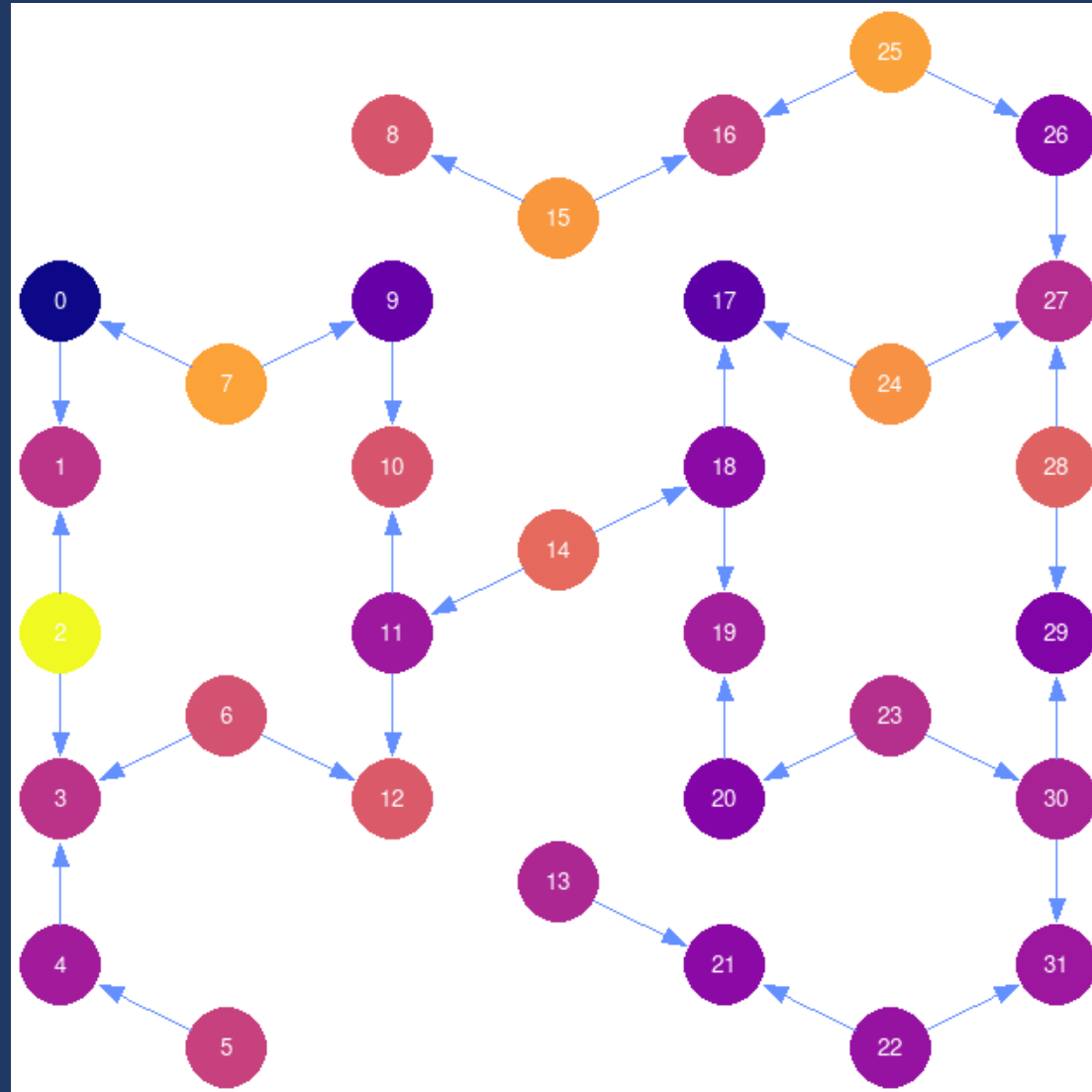


QmIO

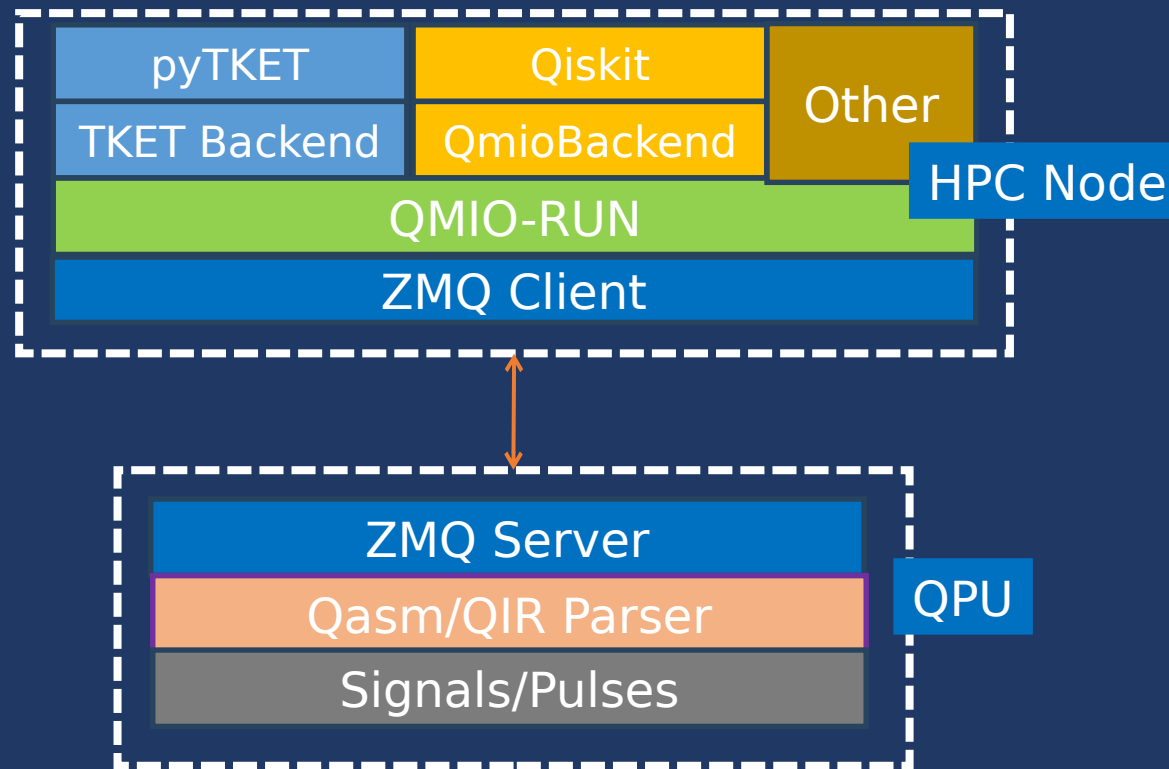
How to request access?

- <https://quantum.cesga.es/access/>

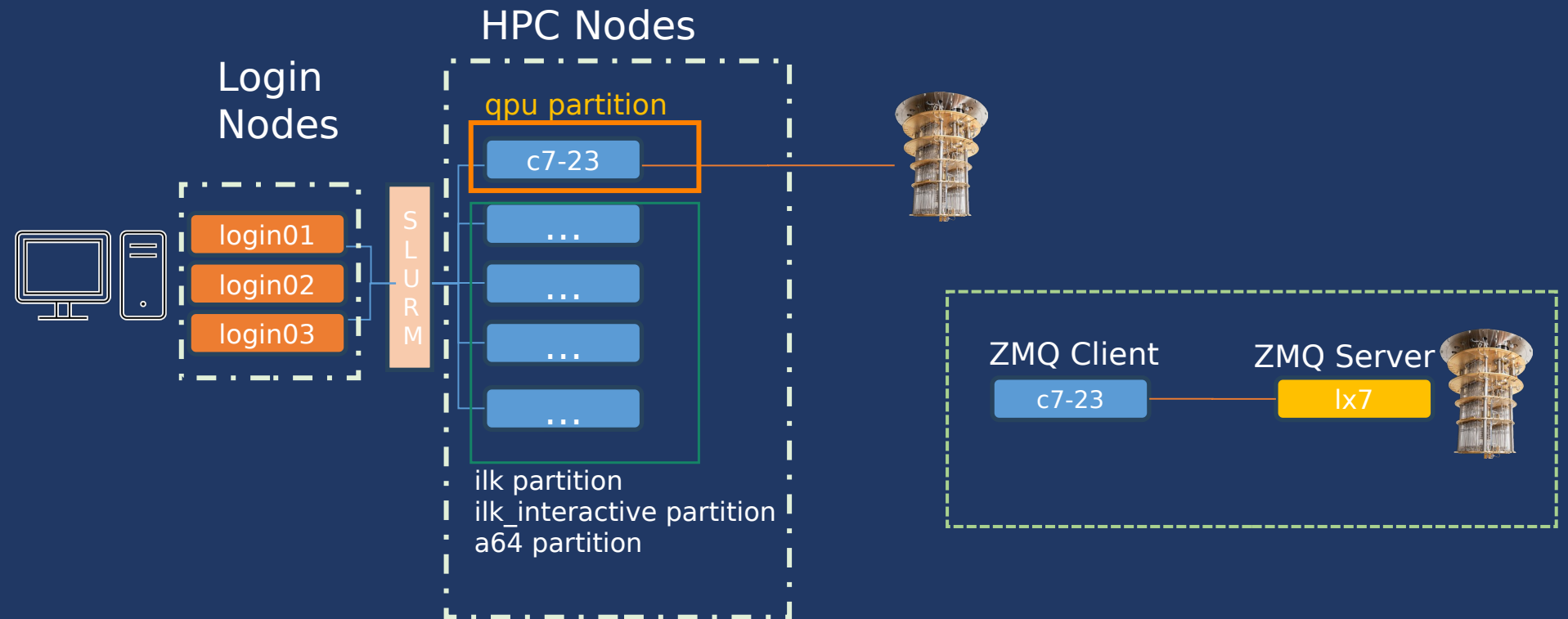
Qmio QPU Topology



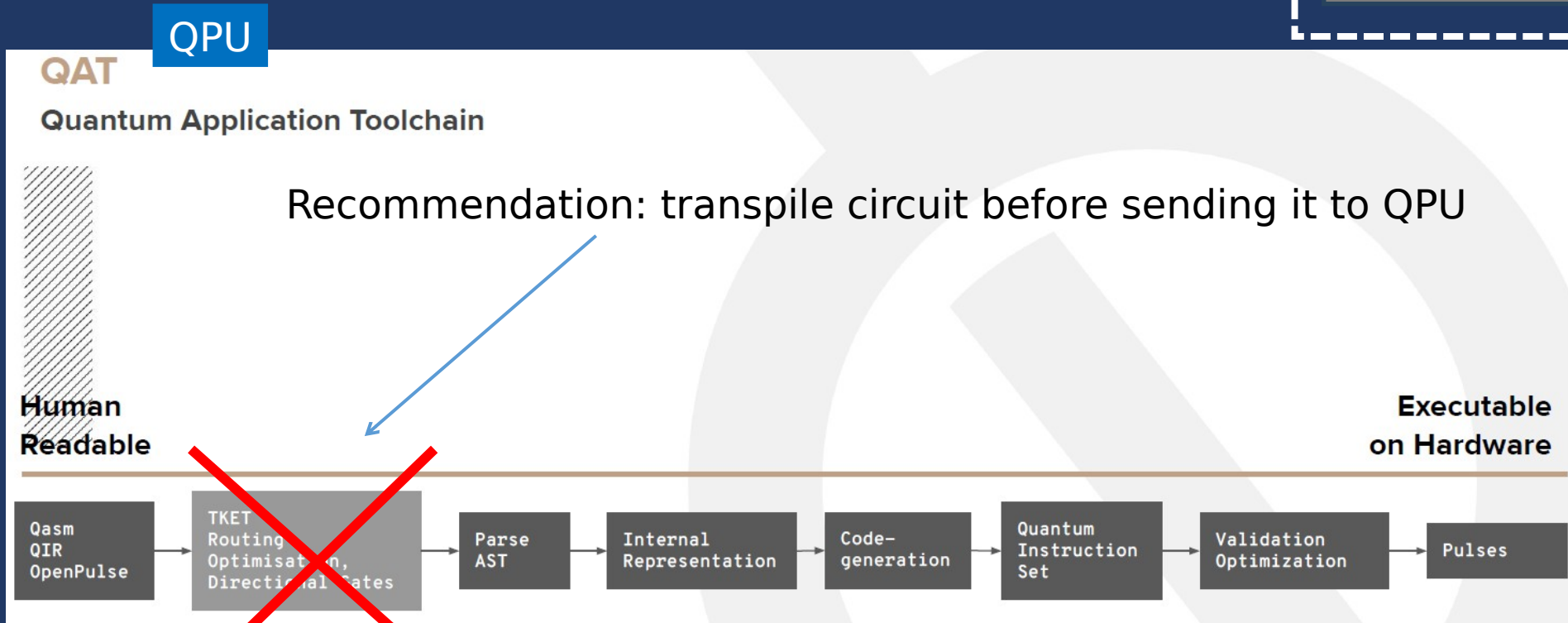
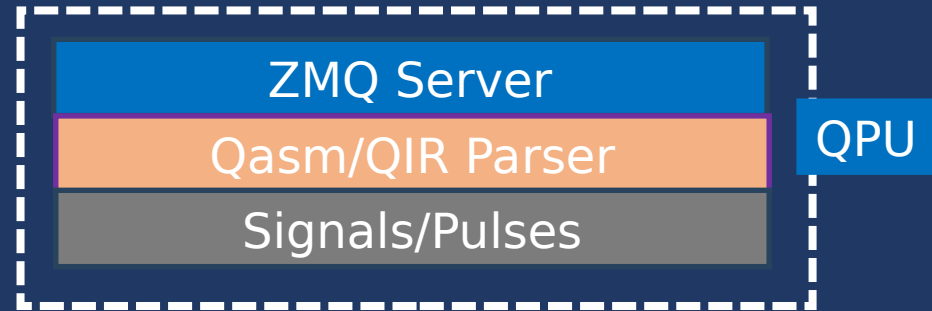
Qmio QPU Software stack



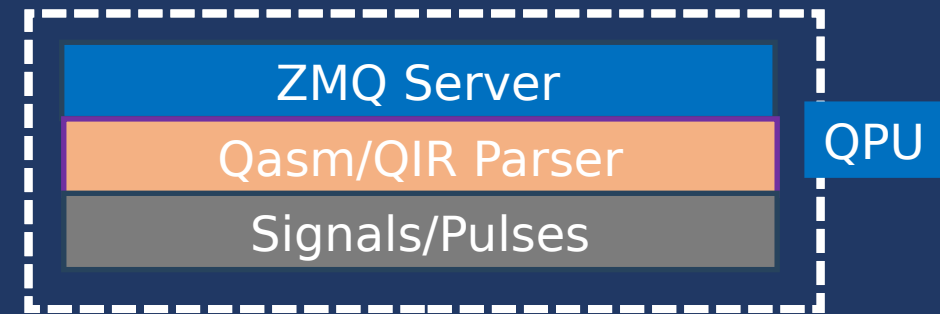
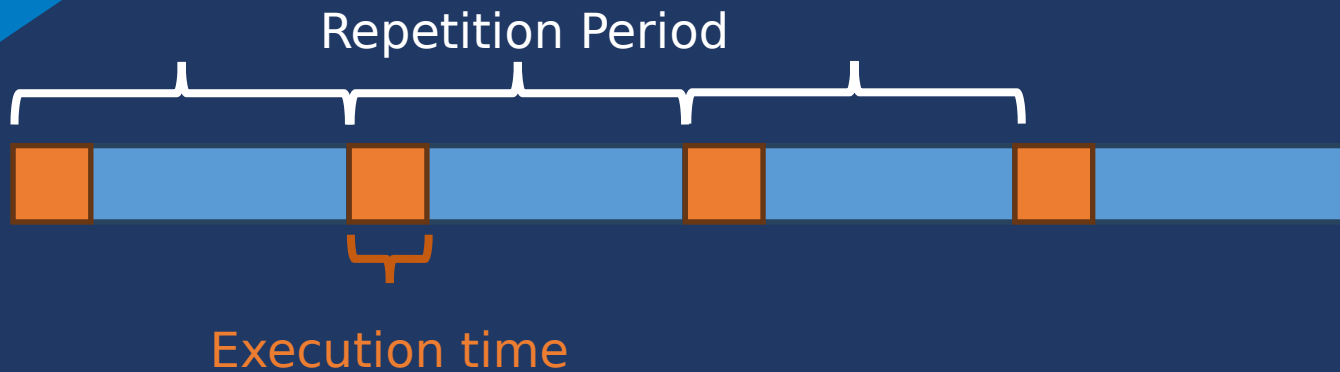
Qmio QPU Software stack- Lowest level



Qmio QPU – QPU Software stack



Qmio QPU – Software stack- Repetition_period



o Ejemplo:

```
service = QmioRuntimeService()
```

```
with service.backend(name="qpu") as backend:
```

```
    results = backend.run(input, shots, repetition_period, res_format)
```

o Necesario ya que no hay inicialización activa (por el momento). Así que $\sim 5 * T_1$

En colaboración con:

