

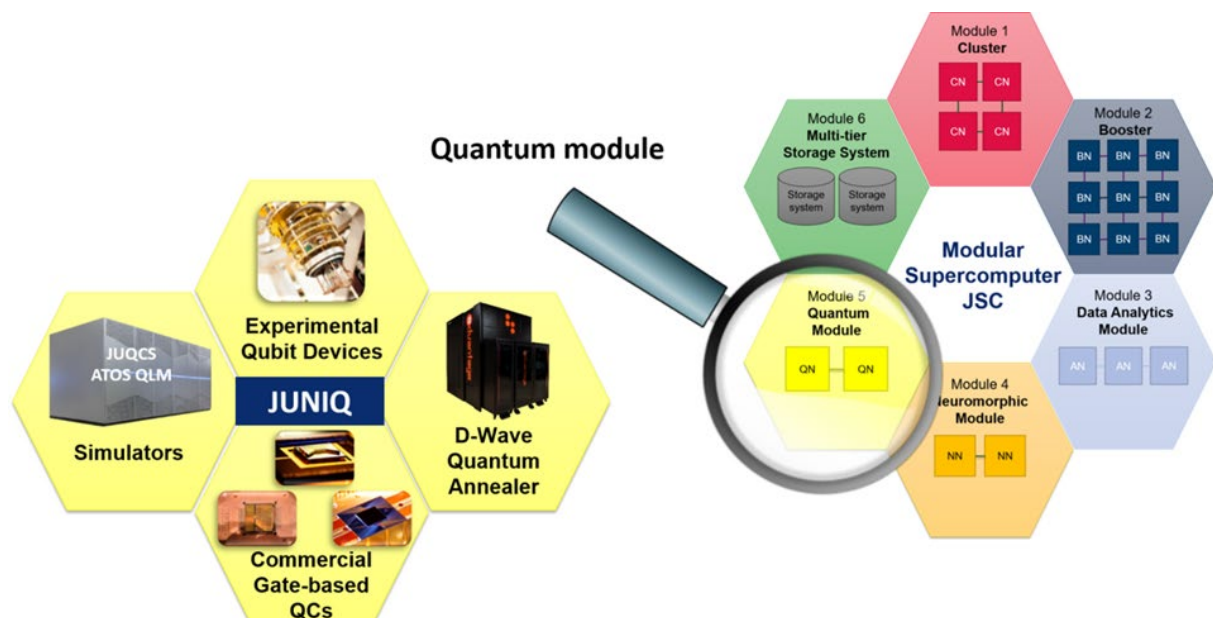
# JUNIQ

## at Forschungszentrum Jülich

Quantum computing and quantum annealing – innovative computational methods for solving highly complex problems – have a variety of potential applications. However, it will take many years until these methods are technically mature. To get involved in the practical application of quantum computing at an early stage, Forschungszentrum Jülich has established the Jülich UNified Infrastructure for Quantum computing (JUNIQ) – an infrastructure that is unique in Europe and offers user-friendly access to quantum computing systems for various user groups.

JUNIQ, which is part of the Jülich Supercomputing Centre (JSC), has been under construction since October 2019. The platform will provide German and European users from science and industry with cloud access to various types of next-generation quantum computers as well as direct access to software emulators of ideal and real quantum computers simulated on Jülich's supercomputers.

Under the guidance of experts, researchers will be able to use quantum computers – from experimental systems and prototypes to first production systems – and develop algorithms and application programs for them.



Website JUNIQ:  
<https://go.fzj.de/JUNIQ>



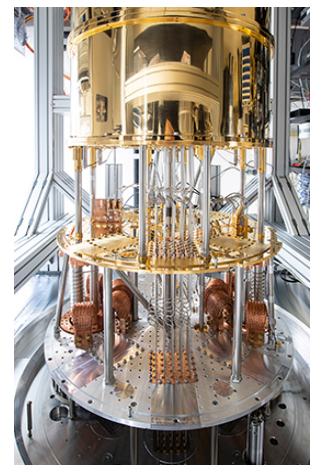
## What does JUNIQ offer?

To enable practical applications, quantum computing systems must be integrated into existing high-performance computing (HPC) infrastructures in the form of quantum hybrid computing systems. Forschungszentrum Jülich has many years of experience in co-designing hardware and software, thus offering ideal conditions for deeply integrating quantum computers into JSC's internationally outstanding modular high-performance computing infrastructure. To this end, JSC is supported by the Munich-based company ParTec.



To establish JUNIQ as a comprehensive, manufacturer-independent user infrastructure, software tools, algorithms, and prototype applications are developed, which are supported by a simulation and data laboratory for quantum computing. Users thus have extensive opportunities to develop quantum algorithms and applications, implement them on leading technology platforms, and evaluate them comparatively.

As part of the platform, JSC operates various quantum computing technologies on-site and can therefore offer its users intervention and control options on a system level in addition to pure cloud access. JUNIQ is not tied to a single system provider and can thus make a wide variety of technologies available. Since JUNIQ provides a uniform universal development platform, systems of different origins can be integrated into comparative studies on the system level: This enables a direct comparison of the current performance and expected developments of different types of systems (i.e. quantum computers, quantum simulators, and quantum annealers). In addition, all these technologies can be emulated and validated on supercomputers using the Jülich Universal Quantum Computing Simulator (JUQCS).



**JUNIQ building:** Quantum computing systems require a special vibration-free location. Therefore, a new building was constructed specifically for the operation of JUNIQ quantum computers. The building's two machine halls have special vibration-damping foundations to absorb vibrations. The building was completed in summer 2021 and will initially house two quantum computers – one D-Wave quantum annealer and, from the end of 2022, a quantum simulator by the French start-up Pasqal.