

# ParTec Company Presentation Wigner Research Centre for Physics Hungarian Research Network

Nurcan Rasig, Chief Sales & Marketing Officer

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It was not possible to formulate the laws of quantum mechanics in a fully consistent way without reference to the consciousness.

— Eugene Wigner —

AZ QUOTES



## Foundation / History

The birth of today's ParTec AG was the spin-off from the University of Karlsruhe in **1999**. The change of legal form (GmbH to AG) took place in **2021**.



## Business Units

- Development and production of innovative and world-leading **modular supercomputers** and **quantum computers**
- Development and production of associated **system software** including consulting and support services
- Worldwide **licensing** of the **dynamic Modular System Architecture (dMSA)**



## Stock market listing

Inclusion in the **Scale** segment of the Frankfurt Stock Exchange on 3 July 2023, also tradable on **Xetra** since 1 August 2023.



## Board of Directors

- Bernhard Frohwitter - Chief Executive Officer
- Hugo Falter - Chief Operating Officer
- Hans Kilger - Chief Financial Officer
- Thomas Moschny – Chief HPC Solutions Officer and Chief Technology Officer
- Nurcan Rasig - Chief Sales & Marketing Officer
- Ina Schmitz - Chief Projects & Consulting Officer
- Dominik Ulmer - Chief Quantum Solutions Officer
- Frank Westermann – Chief Corporate Development and HR Officer

## Supervisory Board

- Prof. Dr. Reimund Neugebauer
- Prof. Dr. Thomas C. Schulthess
- Iram Kamal

**2005**

Start of cooperation with the Jülich Research Centre (FZJ)

**2010**

Development of the "dynamic Modular System Architecture" (dMSA)

**2017**

Operation of JURECA, the world's first modular supercomputer

**2020**

Operation of JUWELS "Booster", the fastest supercomputer in Europe at the time and number 7 on the TOP500 list

**2022**

Successful participation in the tender for the Israel National Quantum Initiative EuroHPC JU MareNostrum5 Contract Award for ParTec and Atos

**2023**

Announcement of QBridge, SW for the integration of classical and quantum computers

Listing on the Frankfurt Stock Exchange and Xetra

EuroHPC JU JUPITER Contract Award for ParTec and Eviden

Announcement of "ParTec Quantum Facility" in Munich



**>150**

patents granted and registered in the world's industrialised regions



**8.000.000**

#shares

**~1.029.000**

Shares in free float (13%)



**>50**

Number of employees plus freelancers and researchers (strongly increasing)



**27%**

Shareholders' equity ratio 2022

**+84% CAGR**

Ø Revenue growth p.a. since 2020

**~100 Mio. EUR**

Revenue 2023 (Source: Montega)

# Customer Success Stories for dMSA

- JURECA Cluster-Booster System: Ranked 13th in the TOP500 list and 29th in the Green500, June 2023, JURECA is a testament to the success of dMSA.
- JUWELS Modular System: The successor to JURECA, JUWELS continues to redefine what's possible in supercomputing.
- MeluXina Supercomputer: Achieving a ranking of 57 in the TOP500 and 26th in the Green500 list, June 2023, MeluXina showcases the European technology's success.
- LEONARDO: EuroHPC JU Pre-Exascale, ranked 4th in TOP500 in June 2023





# ParTec Customer and Partner (growing)





**EuroHPC**  
Joint Undertaking

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# First to the future

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**EVIDEN**

For the JUPITER procurement, ParTec and Eviden have teamed together to provide the best possible combination of **European partners to deliver a dynamic Modular Supercomputing Architecture built on a strong base of European research and development activities and fully designed and manufactured in Europe.**

The partners are bidding as a group of economic operators, with Eviden acting as the coordinator (“Consortium”). Within the Consortium roles are as follows:

- **Eviden are responsible for**

- The design and supply of the accelerated (GPU) Module
- Maintenance and support of JUPITER consistent with current JUWELS system
- Integration of physical infrastructure within the Modular Data Center

- **ParTec are responsible for**

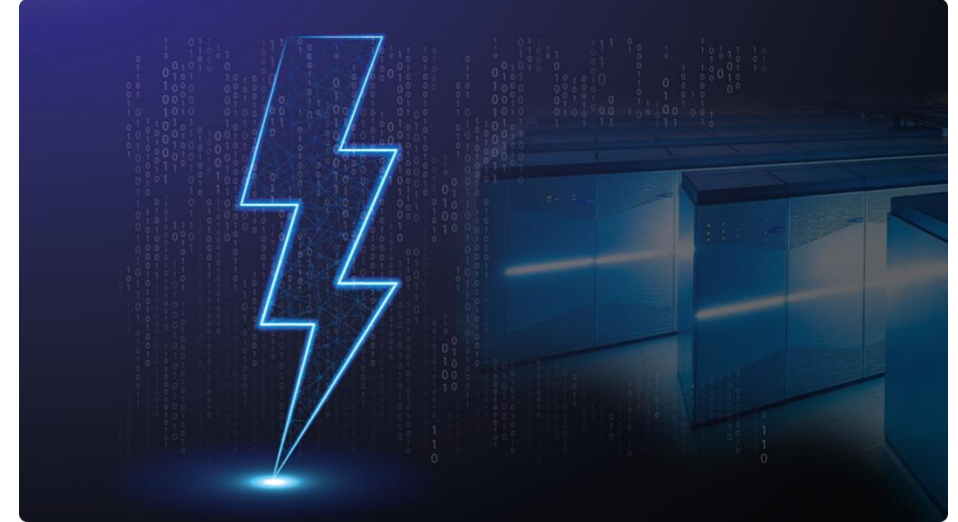
- General purpose (CPU) Module incl. European processor
- I/O Flash Module based on Spectrum Scale to tightly integrate with existing storage environment
- Overall dynamic Modular Supercomputer Architecture and integration of the GPU, CPU, and I/O Flash partition to one modular system



# Driving Exascale Innovation

**JUPITER** is designed to tackle the **most demanding simulations AND compute intensive AI applications** in science and industry. Applications will include






- training large foundation models for generative AI,
- simulations for developing advanced materials,
- creating digital twins of the human heart or brain for medical purposes,
- validating quantum computers, and
- high-resolution simulations of climate that encompass the entire Earth system.

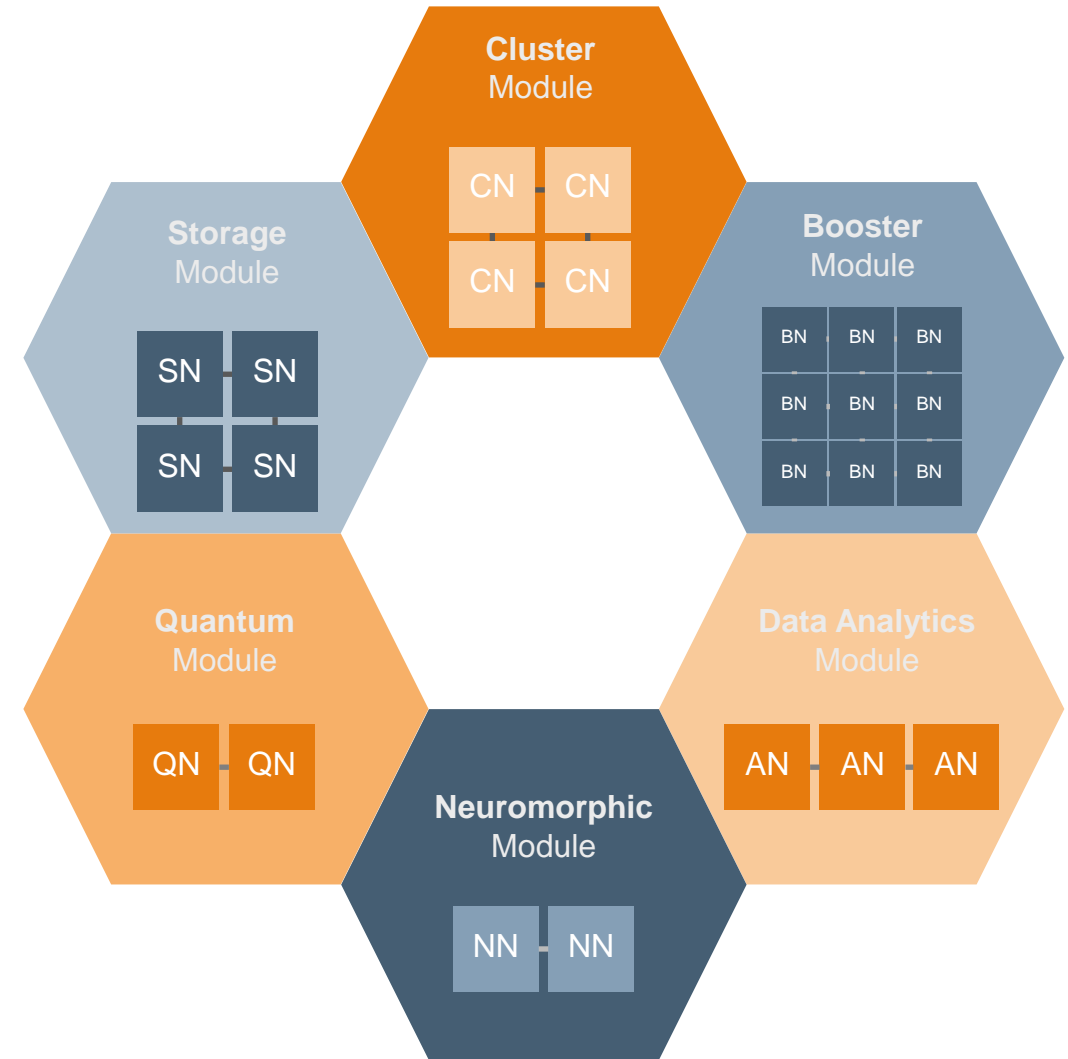


**JUPITER will be composed of three modules (can be extended in the future):**

- (1) a highly scalable accelerated Booster Module based on next-generation NVIDIA GPUs,
- (2) a tightly integrated general-purpose Cluster Module based on SiPearl Rhea1 with high memory bandwidth processors and
- (3) an I/O Flash Module based on Spectrum Scale for seamless storage integration.

## Result of the series of DEEP projects

-  Generalization of the Cluster-Booster Concept
  - Heterogeneity on the system level
  - Effective resource sharing
-  Any number of (specialized) modules possible
  - Cost-effective scaling
  - Extensibility of existing modular systems by adding modules
-  Fit application diversity
  - Large-scale simulations
  - Data analytics
  - Machine/Deep Learning, AI
  - Hybrid-quantum Workloads
-  Achieve leading scalability and energy efficiency
  - Exascale-ready!
-  Unified software environment for running across all modules
  - Enabled by the ParaStation Modulo software suite









**EuroHPC**  
Joint Undertaking

# MareNostrum

**EuroHPC JU**  
**MareNostrum 5**



© Atos

**Atos**







## Atos

### Program Management

Full accountability for the contract, including de planning, at Program Director level

Delivery scope (Deploy & Support)

- Accelerated partition deployment
- Next Gen General Purpose Partition



### Project and Technical Management

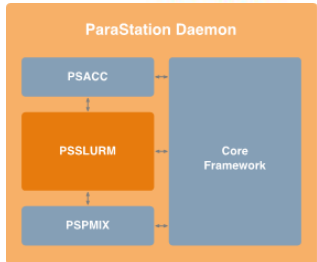
Provides key roles for the contract

- Project Management, including supplier coordination (Lenovo and IBM)
- Senior Tech Advisor

Delivery scope (Deploy & Support)

- Technical Site Preparation
- General Purpose Partition
- IO Partition
- Highspeed interconnect
- Management Network
- Software stack for cluster management
- Next Gen Accelerated Partition

### ParaStation MODULO



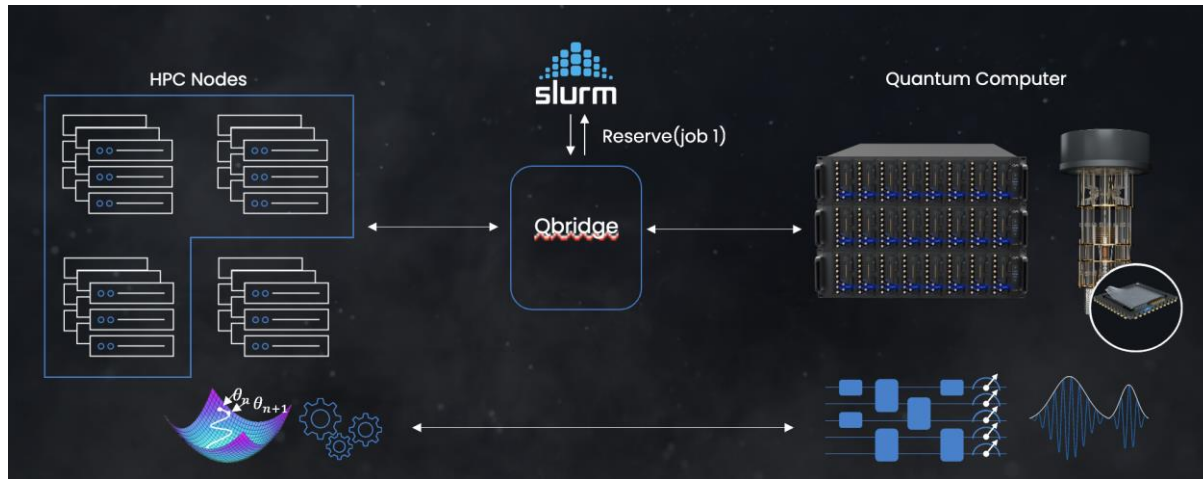
### Dynamic Modular System Architecture

### ParTec Quantum Factory



### Evaluating New Technology

### QBridge – integrating HPC and Quantum Computing



# SIPEARL



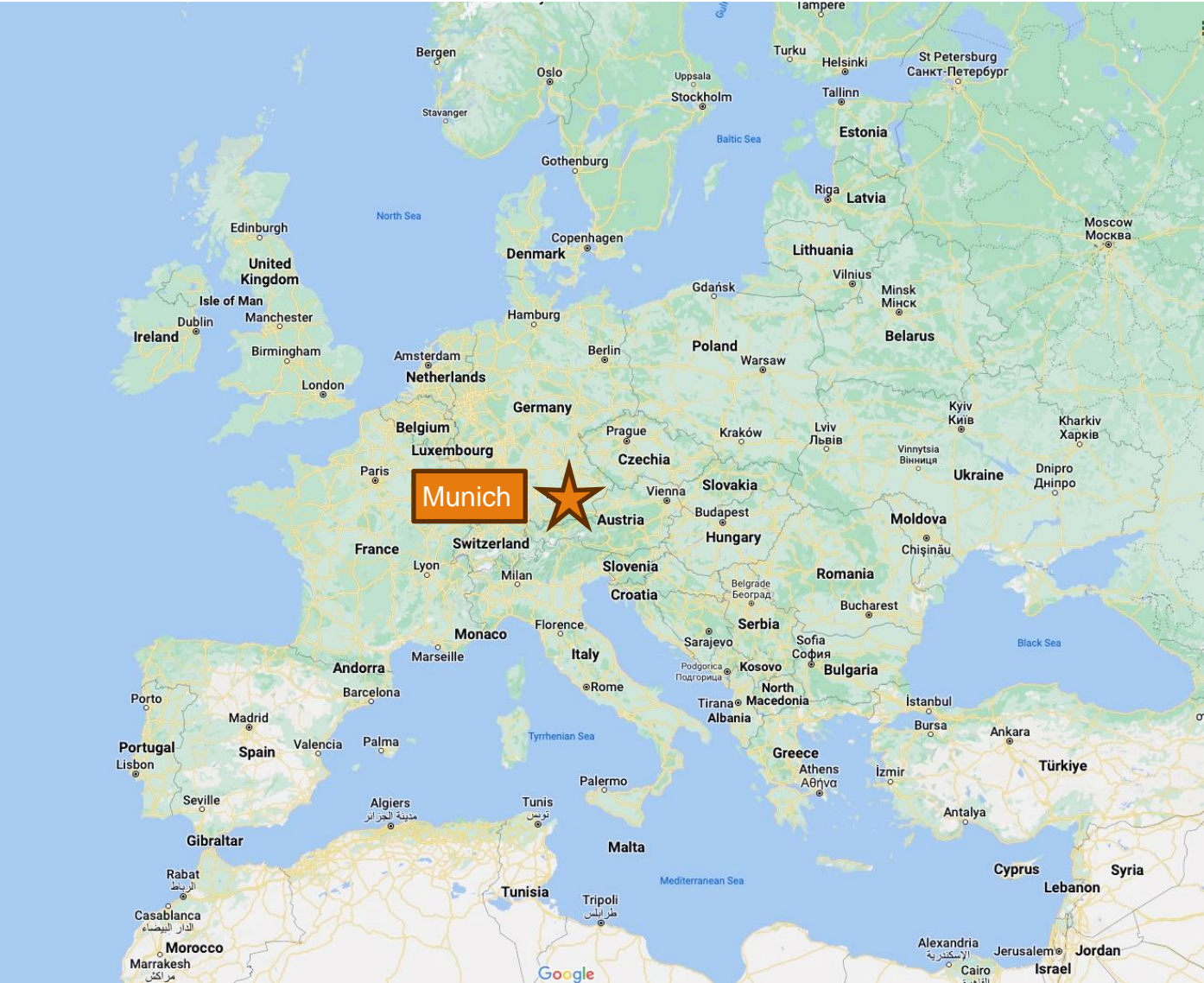
- **Quantum Computing status**

- still very much in the research phase
- a lot of uncertainty about the final technology solutions/platforms
- **BUT** getting close to the first real applications -> time for early adopters getting ready

- **New: ParTec in the process of building “bridges” to Quantum Computers**

- Major investments in Quantum Computing both in resources, architecture and services
- Investment to build our first factory in the Greater Munich area
- Operational in mid to late 2024

- ParTec's manufacturing site for quantum products
  - Allows parallel integration of several systems
  - Spare-part storage for customer installations
  - Customer training and events location
- Development and testing infrastructure for classical compute SW
- Located in the Greater Munich area, in the heart of Europe
- Excellent connectivity by land and air
- Expected start of operations in H2 2024



- **ParTec is building qubit agnostic solutions – a framework to allow**
  - early adapters and customers to use the same solution architecture to test the various quantum technologies simultaneously
    - protecting their SW investments as well as some of their HW investments
  - researchers to get invaluable early access and obtain the necessary skills needed to get ahead of their competition
- **ParTec's QC activities**
  - Participating in several quantum related R&D projects funded by the European Commission and/or BMBF (e.g. HPCQS, QSOLID)
  - Using our very good relationship to key research centers and defense-related organisations
  - Hiring several experts in quantum computing and HPC - team is growing !
  - Numerous relationships and agreements with quantum providers





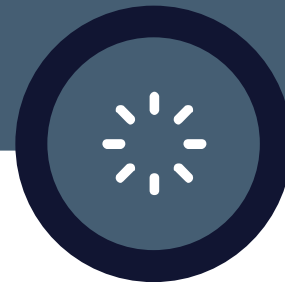
## OPEN THE SOFTWARE STACK

- Use open SW as much as possible
- Use open APIs
- Allow modifications by the customer
- Enable fully-functional and secure HPC-QC integration built on industry standards



## QUANTUM IS TRICKLE-DOWN TECHNOLOGY

- Start with custom-engineering projects  
→ adds engineering costs
- Down-select and harden custom-engineering solution technologies for developing standardised products  
→ lowers price



## PREFER TECHNOLOGIES WITH HIGH PRODUCTISATION POTENTIAL

- Work with industry leaders and chose technologies:
  - with higher level of maturity
  - with potential for miniaturisation
  - with established manufacturing processes
  - with development potential for fitting into standard data centre environments



## Early Market Momentum

- **Lipari:** Development of HPC-QC integration software product in collaboration with Quantum Machines, Tel Aviv, since end of 2021
- **CQC (Lab for Cryo Quantum Computing):** Four-way collaboration on component-based quantum computer design and HPC-QC integration between Goethe University Frankfurt, Jülich Supercomputing Centre, ParTec and Quantum Machines
- **INQI (Israel National Quantum Initiative):** Establishment of a national quantum computing centre in Israel (**QCC**). Multi-party consortium led by Quantum Machines including
  - ParTec (cloud-based front-end, HPC-QC integration, **superconducting qubit** solution)
  - Infleqtion/Coldquanta (**neutral atoms**)
  - Orca (**photonic annealer**)
  - QuantWare
  - Plus AWS, Classiq, Super.tech and many academic institutions
- **LUMI-Q (IT4):** Participating at the market evaluation survey for their upcoming EuroHPC QC procurement

## PRIME



## SUBCONTRACTORS



## TARGETS

- Provide a fully integrated HPC/QC computing environment for remote access
- Enable access to cloud (AWS) and on-premise resources seamlessly via a single scheduling environment
- Support uniform user access to different kinds of quantum computers:
  - Super-Conducting, Photonics & Cold Atoms



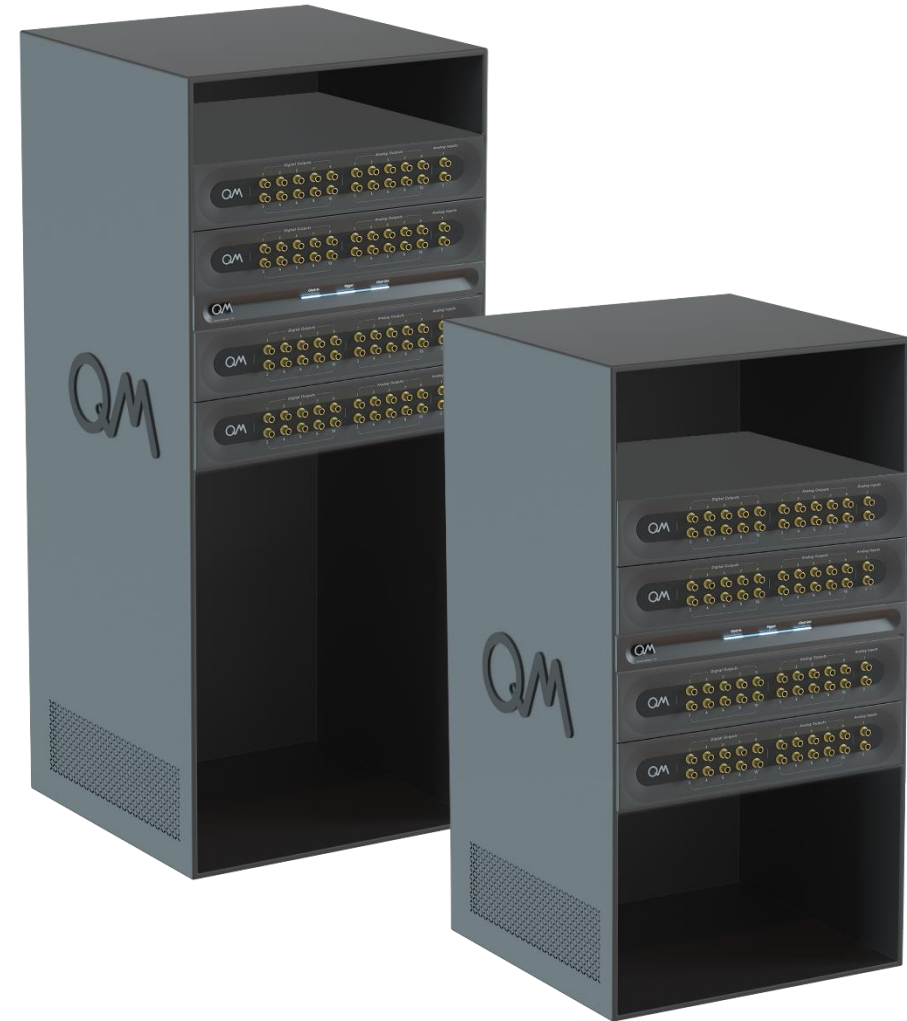
## PARTEC'S ROLE

- Develop, maintain and administer the hybrid cloud/on-premise environment
- Provide user management APIs for user portal
- Assemble and maintain the user software environment supporting both classical and quantum computing
- Enhance the Lipari Software according to upcoming user requirements



## Key partner: Quantum Machines

- Industry leaders in quantum control providing integrated RF and DC voltage sources with digitizers
- OPX1000 platform is widely adaptable and can be used with multiple types of quantum system and scaled to large qubit counts
- Pioneers in using classical computing to optimize the performance of QPUs, optimizing pulse control as close to the QPU as possible
- Supports QUA programming language allowing pulse level control of the system and is widely adaptable to quantum systems
- Currently used by both industry and academia
- Recently acquired Q-Devil who produce auxiliary components for QPUs such as filters and magnetic shields





- Market leaders in quantum machine learning, QML, focused hardware
- Quantum system uses optical time bin qubits to form a quantum annealer
- Based on mature optical photonic components, widely used in telecommunications
  - Reduces costs of components
  - Increases reliability of system
- Modular hardware design enables upgrade to higher performing components and new capabilities without the need to fully replace the system
- Hardware designed to slot into data-centres without the need for modification
- Designed from the start to support hybrid quantum classical workflows with dedicated SDK for QML applications

