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Origin Quantum

# QUANTUM COMPUTING T&R PLATFORM

## PRODUCT MANUAL



Quantum Computing

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# 01 PRODUCT INTRODUCTION

The Quantum Computing T&R Platform is an educational platform designed for universities, aiming to assist higher education institutions and organizations in establishing their own quantum computing teaching systems. The platform provides a comprehensive solution covering everything from a quantum computing learning center, graphical practice of quantum circuits, and a code programming training environment, to algorithm example analysis and teaching resource management. By integrating fundamental theories with practical projects, it is dedicated to cultivating quantum computing professionals with hands-on capabilities.




# 02 APPLICATION SCENARIOS

| | | | |
|---|---|---|---|
| Target Users | University teachers | University students | Research institutions |
| Applicable Scenarios | Cultivation of quantum computing talents | Quantum basics, computing, and programming instruction | Designing quantum applications |

## COMMON ISSUES AND REQUIREMENTS

- Students are relatively receptive to theoretical knowledge taught in class, but their ability to apply that knowledge to solve practical problems is relatively weak. Moreover, the cultivation of hands-on skills and team collaboration awareness is often neglected.
- Teaching resources are either scarce or scattered, lacking a unified management channel.
- There is a lack of unified and standardized process and platform support for stages such as academic competitions, experimental project advancement, and comprehensive practical training.

# 03 PLATFORM FEATURES

1. Provide quantum OriginQ Composer, integrating both quantum computers and quantum simulator operating environments to meet diverse teaching and research needs.

2. Provide an IDE that supports mixed-language programming with QPanda3 and Python, meeting the algorithm implementation needs of various quantum algorithm developers.

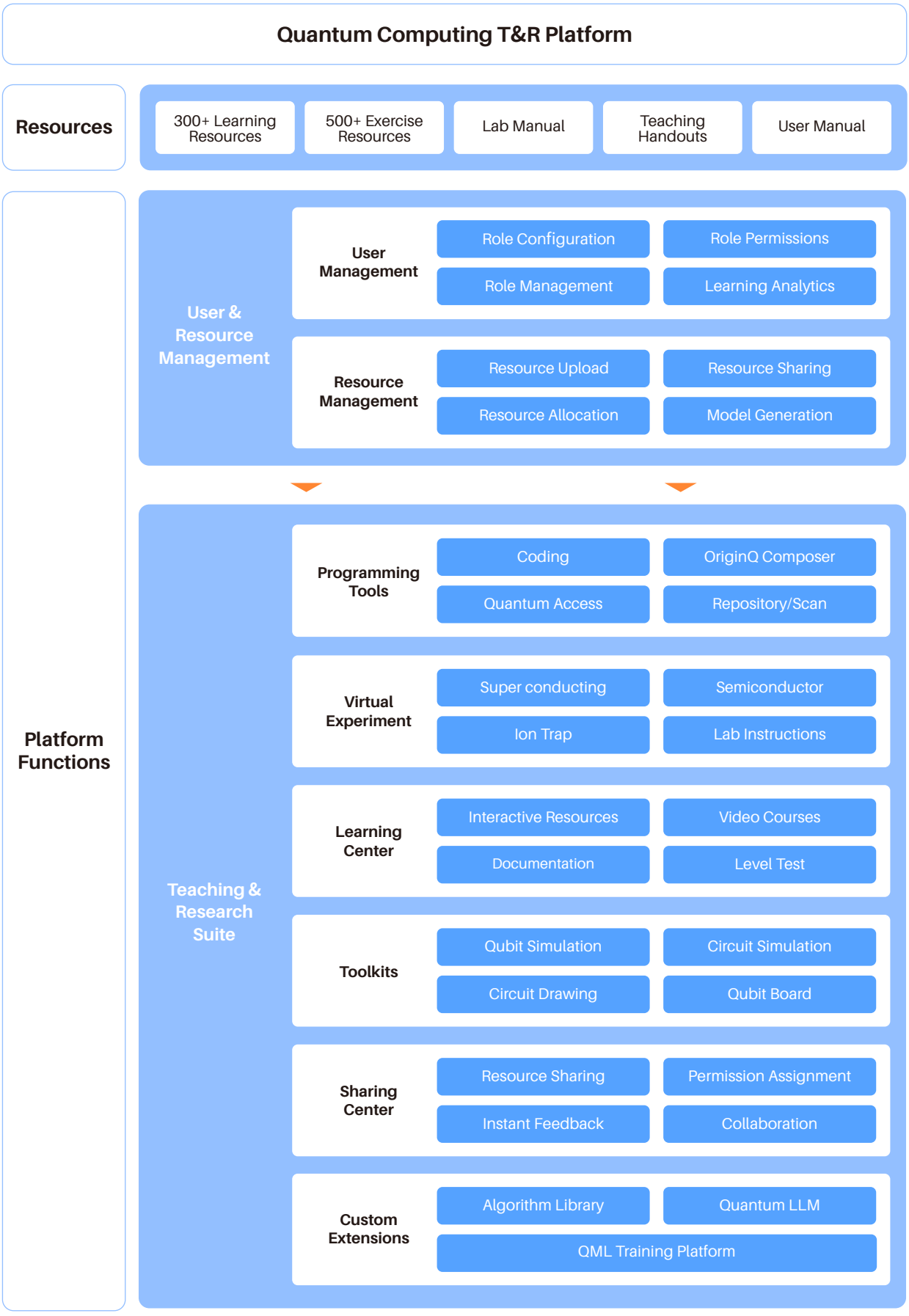
3. Provide a Code Repository to facilitate team collaborative development. Integrate Code Evaluation functionality to gain timely insights into programming code quality, enabling teaching tailored to learning.

4. The Learning Center provides diversified learning modes, achieving an integrated process of learning, practice, and assessment to facilitate efficient internalization of knowledge.

5. Leveraging the Virtual Laboratory, a 3D virtual learning mode is created to enable immersive exploration of quantum computers based on multiple physical systems.

6. Integrate multiple modules such as Toolkit, Sharing Center, and Quantum Large Model to build a comprehensive learning system.

7. Provide one-stop management of members, permissions, and resources, enabling teachers and administrators to easily oversee the entire teaching process, achieve efficient resource allocation, and freely schedule resources.


Quantum Computing T&R Platform
Resources
300+ Learning Resources
500+ Exercise Resources
Lab Manual
Teaching Handouts
User Manual
Platform Functions
User & Resource Management
User Management
Role Configuration
Role Permissions
Role Management
Learning Analytics
Resource Management
Resource Upload
Resource Sharing
Resource Allocation
Model Generation
Teaching & Research Suite
Programming Tools
Coding
OriginQ Composer
Quantum Access
Repository/Scan
Virtual Experiment
Super conducting
Semiconductor
Ion Trap
Lab Instructions
Learning Center
Interactive Resources
Video Courses
Documentation
Level Test
Toolkits
Qubit Simulation
Circuit Simulation
Circuit Drawing
Qubit Board
Sharing Center
Resource Sharing
Permission Assignment
Instant Feedback
Collaboration
Custom Extensions
Algorithm Library
Quantum LLM
QML Training Platform

# 04 PROGRAMMING TOOLS

## OriginQ Composer

OriginQ Composer allows users to quickly build quantum circuits by dragging and dropping logic gates. It is easy to get started with, making it suitable for users with weaker programming skills. Here you will get:

01 **Cloud-based access to superconducting quantum computer**

02 **Four simulators available for free**

03 **Providing three types of visualization for quantum circuit prediction results**

04 **Providing various single-qubit and multi-qubit gates**







- **Full-amplitude Quantum Simulator**
- **Single-amplitude Quantum Simulator**
- **Partial-amplitude Quantum Simulator**
- **Noise Inclusive Quantum Simulator**

## IDE Programming

IDE Programming is a lightweight cloud-based quantum computing programming tool. It runs in a browser, requiring no installation or configuration, while integrating code repository and code evaluation features, providing users with a one-stop quantum computing programming development experience.

### IDE Programming

Based on Python or C++ as the underlying programming language, integrates the QPanda programming framework development environment to enable quantum program development.

**Features:**

- Quick start
- No installation or configuration required
- Code highlighting, auto-completion
- Real-time debugging
- Supports plugin extensions
- Basic IDE features

### Code Repository

Multi-user collaborative code development, combined with the IDE programming application, enables remote code collaboration and also supports code hosting in the cloud.

**Features:**

- Code management
- Branch management
- Permission & version management
- Cloud-available
- Code modification history
- Team collaboration

### Code Evaluation

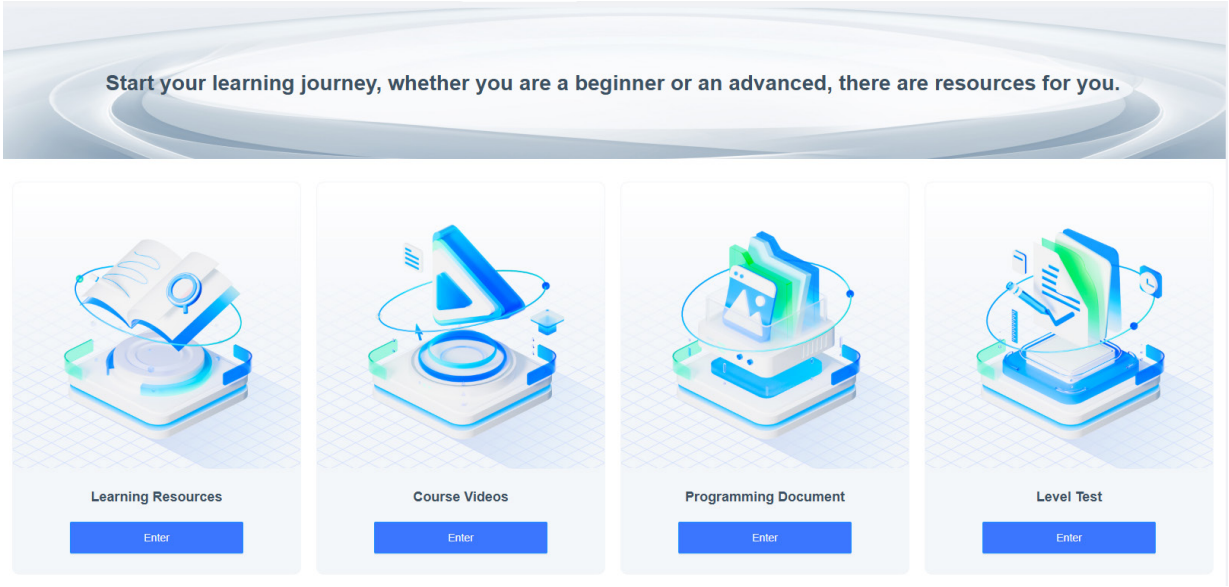
Leveraging a self-developed quantum programming code quality monitoring system, it evaluates the code written by users on the platform.

**Features:**

- Code scanning
- Regularly pushed evaluation reports
- Visual issue list
- Code modification suggestions

# 05 LEARNING CENTER

The learning center integrates diverse teaching resources to create a comprehensive module that combines learning and testing functions. It has established a complete knowledge system spanning from the fundamental theories of quantum mechanics to the practical applications of mainstream quantum algorithms. This module offers users a clear learning pathway, assisting them in gradually solidifying their theoretical foundations in quantum mechanics and enhancing their practical skills in quantum programming.




## Learning Resources

Combining fundamental quantum know ledge points with exercises, enabling users to practice as they learn and receive immediate feedback.

## Course Videos

Covering the explanation of the basic theories of quantum computing, teaching on the use of programming tools, and video courses on application in industry fields, guiding users to understand the relevant knowledge of quantum computing.




## Programming Document

Provides theoretical teaching documents on programming to help users gain an in-depth understanding of programming knowledge and enhance their programming skills.

## Level Test

This module integrates basic theoretical tests with algorithm examples to examine and en hance users' theoretical mastery and practical application abilities.



## Learning Resources

**Content System:** Provides tiered knowledge points and exercises ranging from quantum mechanics and classical computing to quantum algorithms, progressing from simple to complex.

**High Interactivity:** Features over 40 manually operable human-computer interaction models to make learning more engaging and enjoyable.



## Programming Documentation

**Learning Guidance:** Provides tool usage instructions and theoretical documentation to help users quickly get started with basic programming.

**Practice Preparation:** Includes relevant code examples to prepare users for practicing and implementing quantum algorithms.



## Course Videos

**Complete Pathway:** Covers theory, tools, and industry applications, helping to achieve a seamless transition from knowledge to practice.

**Abundant Resources:** Offers over 60 lessons, ensuring thorough knowledge analysis through systematic explanations, meeting the needs of both teaching and self-study.



## Level Test

**Integrated Teaching:** Provides a complete teaching system integrating exercises, exam papers, algorithms, and projects, assesses learning progress, and meets daily practice needs.

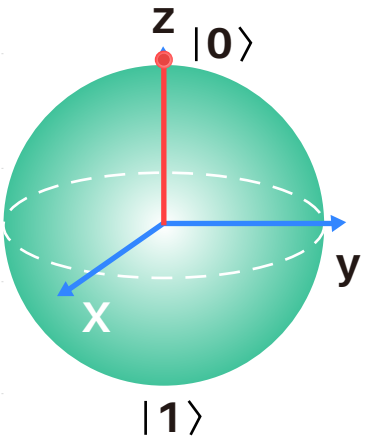
**Self-Building:** Supports uploading your own resources, flexibly creating personalized testing systems, and precisely adapting to teaching needs.

# 06 TOOLKITS

The Toolkits integrates a qubit model, circuit drawing, and multi-user experience. Through visual Bloch spheres, custom gate sequences, and real-time state evolution, it intuitively demonstrates quantum superposition and entanglement. Its modular drawing tool supports complex circuit design and export, while the lightweight multi-user interaction mode seamlessly combines quantum collapse simulation with strategy learning, comprehensively meeting diverse needs ranging from teaching demonstrations to collaborative innovation.

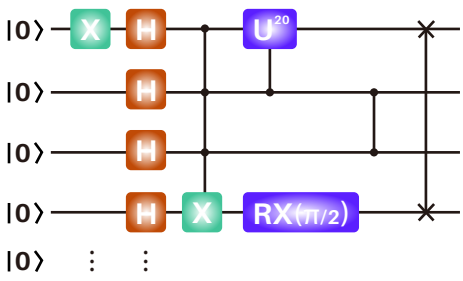
## 01 Qubit Model Tool

- Visual operation panel that synchronizes quantum state changes in real time, enhancing teaching interactivity
- Graphical precise control of single-qubit states with dynamic adjustment of superposition ratios
- 3D Bloch sphere dynamically demonstrates quantum state trajectories, correlating phase and probability distribution
- Built-in complete basic gate set (Pauli-X/Y/Z, Hadamard, CNOT, etc.), supporting free combination and cascading operations of gate sequences
- Supports multi-qubit entanglement operations (e.g., CNOT, SWAP), providing Bell state preparation and entanglement quantitative analysis




## 02 Quantum Circuit Schematic Drawing Tool

- Customizable logic gate parameters and real-time editing functions, interactive canvas supports free positioning and arrangement of logic gates
- Intelligent auto-routing to clearly present hierarchical relationships of complex circuits
- Supports export to mainstream bitmap formats such as PNG, suitable for academic papers and result presentation
- Preset multiple operation types including buses, 0/1 control bits, ellipsis symbols, etc.
- Modular architecture supporting functional extension and customization



## 03 Quantum Computing Multiplayer Experience Tool

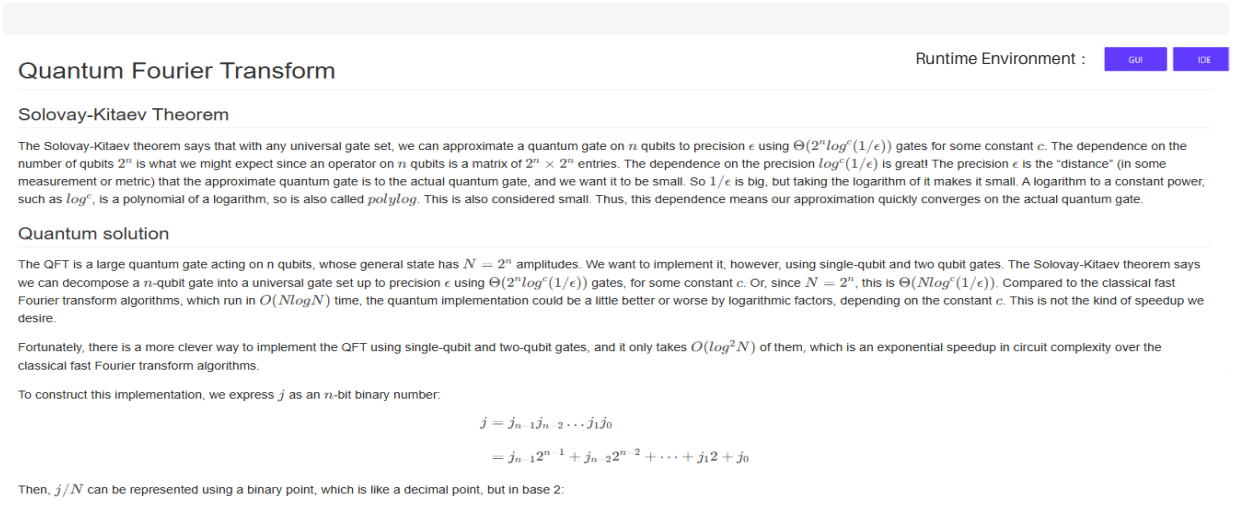
- Integrates 6 types of quantum states and 8 categories of quantum gates (including Hadamard, Pauli, phase gates, etc.)
- Supports simulating quantum collapse and incorporates global phase
- Intuitive interactive interface that lowers the barrier to understanding quantum operations
- Lightweight multiplayer matching mechanism that balances strategy and educational value




# 07 ALGORITHM LIBRARY

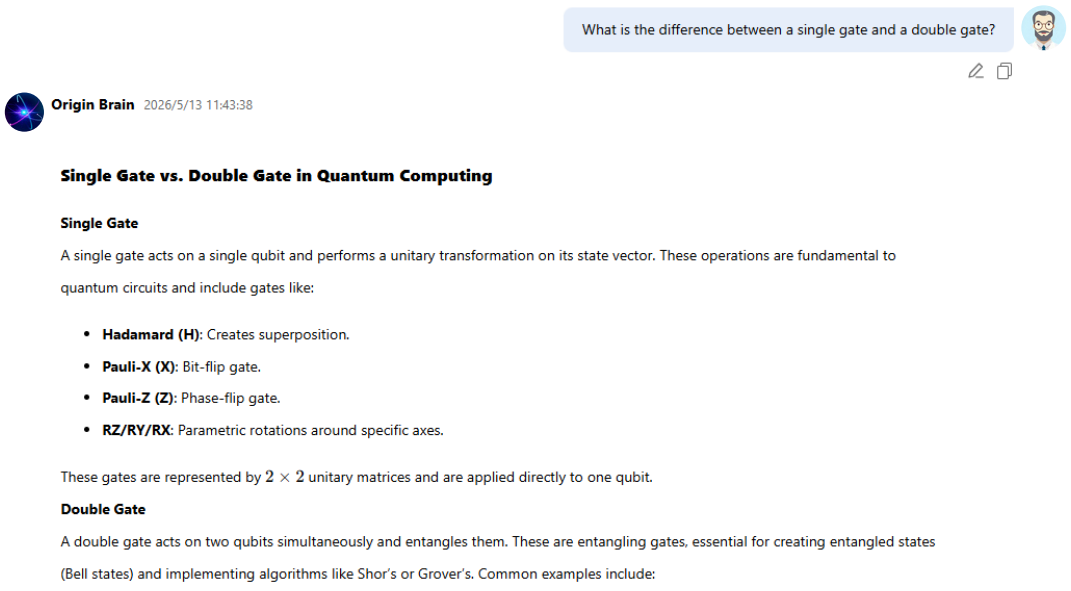
The Algorithm Library brings together common quantum algorithms from multiple types and domains, providing detailed principle explanations for each algorithm. Users can directly run the corresponding code via GUI or IDE programming and view the code execution process in real time. This design aims to concretize abstract algorithms — through algorithm principles and demonstrations — effectively helping users understand the core logic, implementation steps, and operational mechanisms of the algorithms.

- Comprehensive Algorithm Collection: Provides a variety of classic quantum algorithms from multiple types and domains, along with detailed explanations.
- Debugging: Supports one-click execution via GUI, or running and debugging the accompanying code in the IDE environment.
- Intuitive Learning Experience: Allows users to view the code execution status in real time, transforming abstract algorithm logic into a visualized implementation process, thereby deepening understanding.



# 08 QUANTUM LARGE MODEL

Origin Brain is a large AI model developed independently by Origin Quantum, focusing on quantum computing, quantum programming, and related fields. This product deeply integrates quantum computing, quantum programming, and relevant professional knowledge with cutting-edge AI technologies, striving to provide precise, efficient professional knowledge and programming services for quantum researchers, educators, learners, and industry application developers, thereby creating an intelligent knowledge engine for quantum computing and programming.




## Features

- A rich body of quantum computing knowledge
- A learning assistant for quantum programming from theory to practice
- Precisely capturing the intent in quantum professional contexts
- Tailored interaction modes for users with varying quantum computing knowledge
- Efficient dialogue management and historical recall

## Core Technical Advantage

The Origin Brain quantum knowledge large model is built upon extensive knowledge training, precisely targeting professional needs in fields such as quantum computing and quantum programming. Through its highly adaptive intelligent response capability, it provides users with efficient and accurate professional empowerment, serving as an intelligent support core for quantum computing and other related fields.

# 09 VIRTUAL LABORATORY

The Virtual Laboratory integrates various physical system modules, including superconducting, semiconductor, and ion trap systems. Following a systematic process and adopting a task-driven teaching approach, it guides users to explore the core operating mechanisms of quantum computers under each physical system in an easy yet in-depth manner.




- Provides clear operational guidance, textual instructions, and voice prompts, forming multimodal guidance that effectively assists users in completing operations and lowers the learning threshold.
- Adopts an intuitive "mouse + keyboard control" operation logic, allowing easy scene navigation and free adjustment of the viewing angle, delivering a flexible control experience.
- It can display the laboratory scene in 3D, allowing users to freely drag and assemble core components to achieve dynamic construction and verification.
- Provides demonstrations of single-qubit and two-qubit operations, and uses Bloch spheres as visualization tools to intuitively present the state evolution of quantum states.



# 10 SHARING CENTER

The Sharing Center allows users to independently upload and share various types of resources, including documents, videos, compressed files, etc. By aggregating collective intelligence, the platform builds a continuously growing internal knowledge ecosystem, effectively promoting efficient resource circulation and reuse, and fostering collaborative learning and co-creation of experiences.



- **Flexible Resource Management:** Supports free uploading and sharing of resources in multiple formats, with the ability to revoke or delete them after sharing, fully controllable throughout the process.

- **Rich Interaction & Statistics:** The resource page supports likes, favorites, and downloads. Meanwhile, the platform automatically counts the number of likes and downloads for each resource, helping you quantify the impact of your sharing.

Multiple Resources

Resource Management

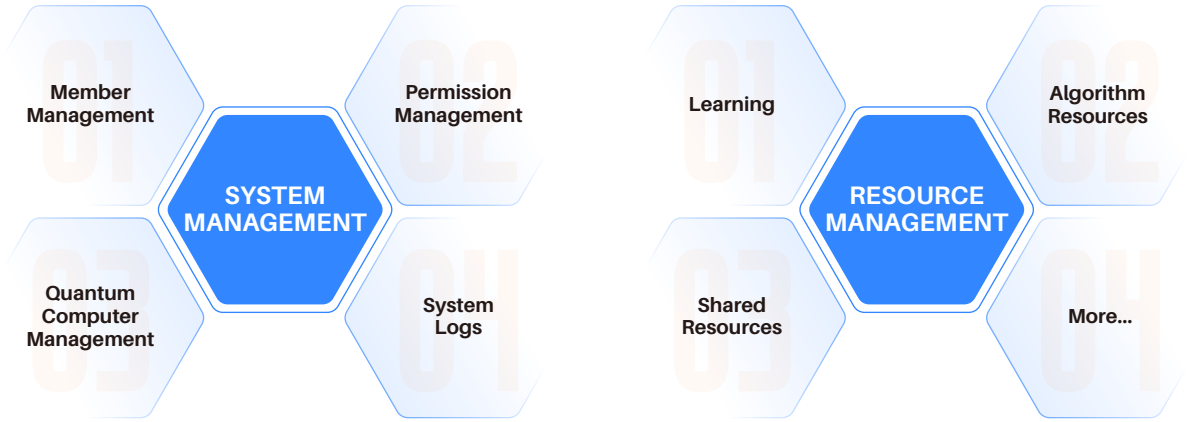
Message Notifications

Likes & Acknowledgments

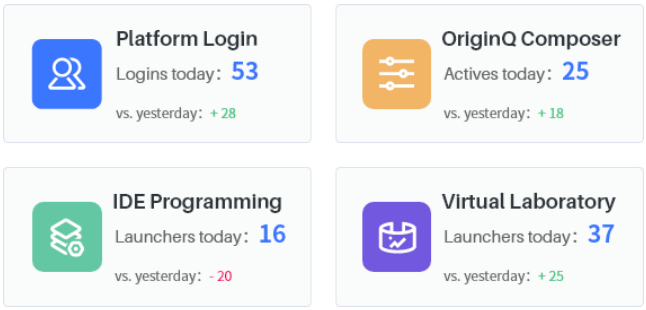
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# 11 MANAGEMENT SERVICES

- The platform provides core functions such as system management and resource management, supports fine-grained permission allocation and member management, ensuring a clear and orderly organizational structure.
- Flexibly configurable user roles and operation permissions enable a secure and controllable collaborative environment.
- Provides convenient and efficient resource management capabilities, comprehensively improving management efficiency and the platform user experience.

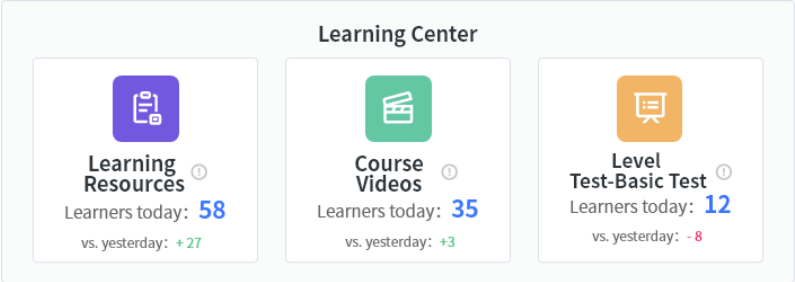



The Statistical Reporting feature systematically collects and integrates student user data, tracking and recording their operational behaviors and learning paths across core modules such as OriginQ Composer, the IDE environment, and the learning center. On this basis, it can present each student's learning process and outcomes from multiple dimensions, including learning progress and practice frequency.




- Automatically tracks and records detailed student usage data across core modules
- Provides feedback on student experimental operations
- Supports export of user usage data

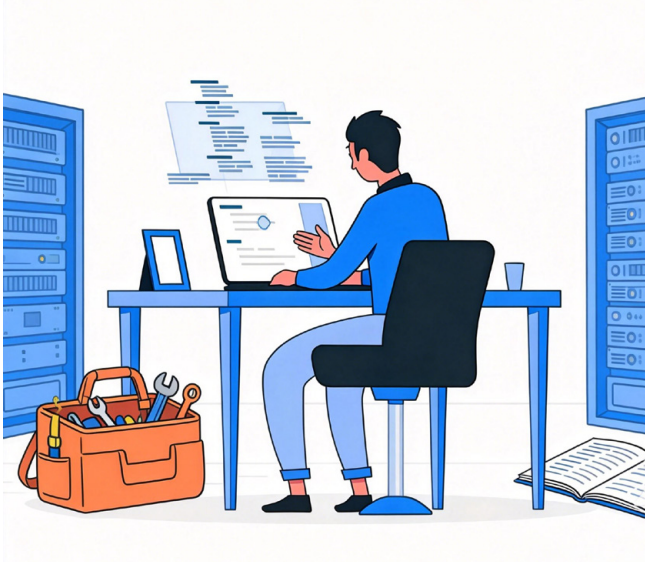
- Records learning behaviors and provides test score feedback
- Helps analyze mastery levels and presents a learning analytics profile



# 12 PRODUCT SERVICES

We are committed to providing you with a comprehensive product service system, supporting in-depth personalized customization, and covering the entire process from requirement alignment, solution design, development and implementation, to final delivery, achieving an end-to-end closed-loop service. This integrated collaboration model is designed to ensure the smooth progress of your project, guarantee delivery quality and efficiency, and keep you worry-free and at ease throughout the journey.

- Installation, Deployment and Training: On-site configuration, debugging, and operation training.
- Technical Maintenance and Upgrades: Trouble-shooting, Remote Technical Support.
- Provide FAQ and online customer service support.
- Provide remote access support, allowing engineers to connect to the device for diagnostics, trouble-shooting, and software fixes.
- Supporting materials include Lab guide, product manual, user manual, and more.



# 13 ABOUT US

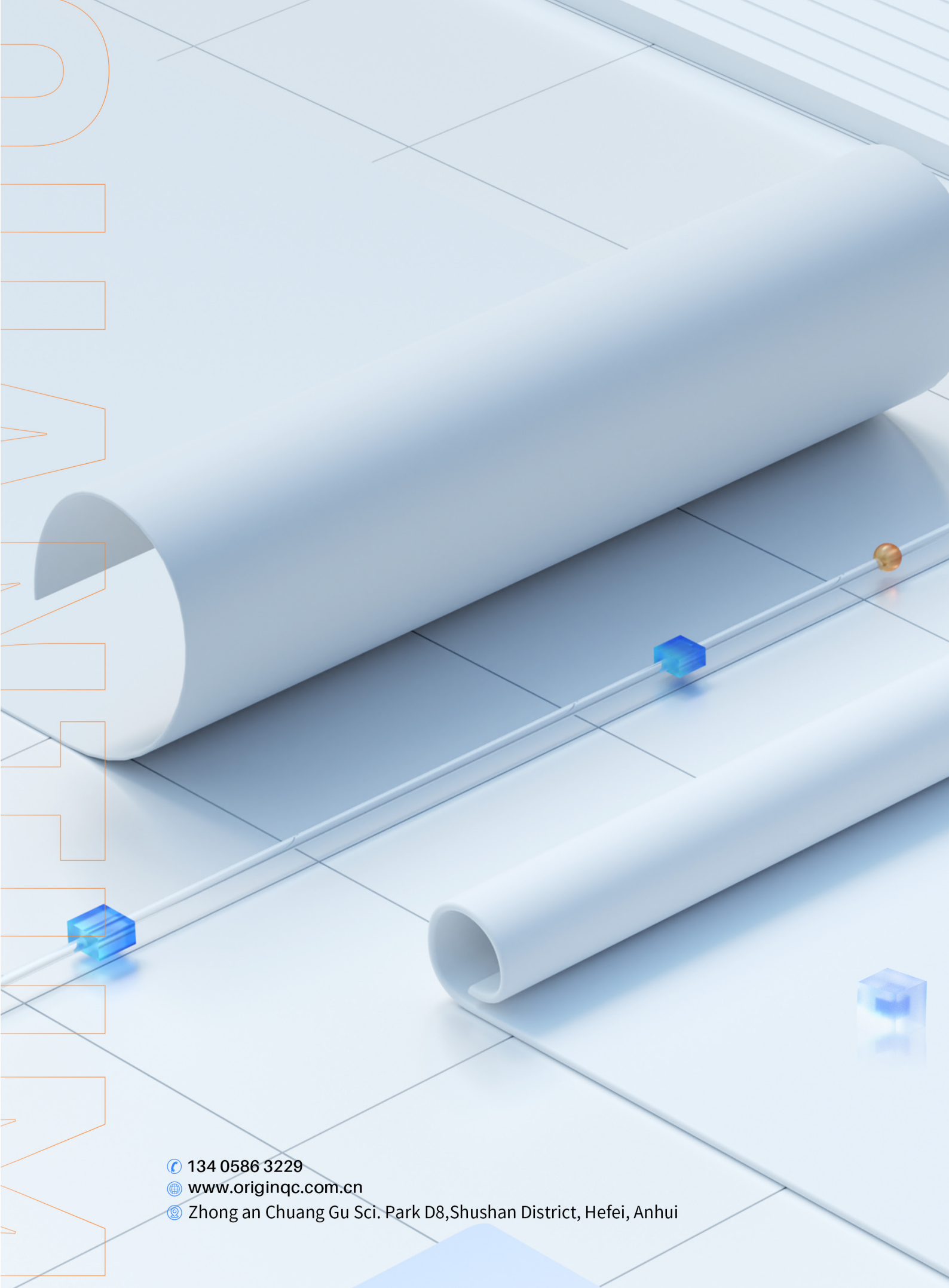
Established in Hefei High-Tech Zone in 2017, Origin Quantum Computing Technology (Hefei) Co., Ltd. (hereinafter referred to as "Origin Quantum") is a leader in China's quantum computing sector, with the CAS Key Laboratory of Quantum Information being its origin of technology. With a focus on building a quantum computing industry ecosystem, Origin Quantum has been working on independently controllable engineering-oriented quantum computers, developing full-stack quantum computing, and actively promoting the industrialization of quantum computing.

## ◎ GOAL

Let quantum computing truly serve humanity beyond the laboratory

## ◎ VISION

Contribute Chinese efforts to quantum computing



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