



# iQD SDK – Optimization for Quantum Circuits

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## 1. Introduction

The iQore SDK enables developers, researchers, and enterprises to apply secure, cloud-hosted optimization logic to quantum circuits without modifying existing hardware or algorithm logic. Using iQD, the SDK optimizes circuits in real-time, improving quantum gate efficiency, entanglement, and fidelity.

Our solution injects the optimization logic securely, never exposing proprietary code, and supports both simulators and IBM QPUs.

## 2. Key Features:

- **Secure Cloud Injection**  
All optimization logic is securely injected from the cloud, never touching your machine or source code.
- **Qiskit-Compatible**  
Works seamlessly with any valid QuantumCircuit, enabling quantum optimization without complex setup.
- **Non-Invasive Workflow**  
Simply call `optimize()`, save your token, and run your circuit. No extra setup needed.
- **Backend-Agnostic**  
Supports simulators like `aer_simulator` and real quantum backends from IBM Quantum, including legacy systems.

## 3. Quickstart Guide

### Install the SDK

```
pip install iqore
```

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## Authenticate with Your Token

```
from iQore import iQoreRuntimeService

# Save a token
iQoreRuntimeService.save_account("Your_Token_Here")

# Retrieve the token
token = iQoreRuntimeService.get_token()
```

## Optimize Your Circuit

```
from qiskit import QuantumCircuit
from qiskit_aer import AerSimulator
from iQore import iQD
import numpy as np

# Quantum backend and matrix
backend = AerSimulator()
matrix = np.random.rand(4, 4)
qc = QuantumCircuit(4)

# Optimize the quantum circuit
iQD.optimize(
    qc,
    qubit_count=4,
    backend=backend,
    matrix=matrix,
    enable_iQD_dtc=True
)

# Sample user logic
qc.cx(0, 1) # Apply a user-defined gate
qc.measure_all() # Measure all qubits

# Display the optimized circuit
print(qc.draw("text"))
```

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## 4. Core Components

### iQoreRuntimeService

Handles token management and securely stores user authentication.

### iQD.Optimize

Performs quantum circuit optimization via secure, cloud-delivered logic.

## 5. Security & Token Architecture

### How It Works

#### 1. Authenticate Securely

You sign in using your personal iQore token — no passwords, no keys to manage.

#### 2. Connect to the iQore Optimizer Cloud

When you call `iQD.optimize()`, your circuit is sent through a secure, encrypted request.

#### 3. Get Your Upgraded Circuit

You receive a fully optimized Qiskit circuit — ready to run — with zero risk of your code or our IP being exposed.

## 6. Circuit Optimization API

| Parameter                   | Type                           | Description                                      |
|-----------------------------|--------------------------------|--|
| <code>qc</code>             | QuantumCircuit                 | Qiskit circuit to optimize                       |
| <code>qubit_count</code>    | int                            | Number of active qubits                          |
| <code>backend</code>        | str or Backend                 | Backend used for execution or optimization guide |
| <code>matrix</code>         | np.ndarray ( <i>Optional</i> ) | Internal enhancement tuning matrix               |
| <code>enable_iQD_dtc</code> | bool ( <i>Optional</i> )       | Enables Dynamic Tensor Controller (DTC) mode     |

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## 7. Real-World Use Cases

- **Quantum Circuit Research:** Enhance algorithms like QAOA and VQE
- **Simulators:** Optimize for statevector, Aer, and other simulation models
- **IBM QPUs:** Submit optimized circuits directly to Qiskit Runtime or legacy IBMQ systems
- **Fidelity Improvement:** Increase the coherence and fidelity of quantum systems with minimal changes to user code

## 8. Support & Licensing

The iQore SDK is licensed under a proprietary license. Redistribution, reverse engineering, or extraction of embedded logic is prohibited.

For commercial licensing or enterprise integration, contact:

- **Email:** [team@iqore.com](mailto:team@iqore.com)
- **Website:** <https://iqore.com>

## About iQore

iQore develops quantum-classical optimization technologies that help developers, researchers, and enterprises extract better outcomes from quantum computing systems. With a focus on secure, high-fidelity optimizations, iQore delivers smarter performance and more efficient execution for today's quantum hardware.

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