

## Quantinuum Product Change Notification

<b>Title of Change:</b>	<b>Helios Release</b>
<b>Date of Change:</b>	November 5th, 2025
<b>Contact Information:</b>	<a href="mailto:QCSupport@quantinuum.com">QCSupport@quantinuum.com</a>
<b>Products Impacted:</b>	Helios,
<b>Changes to Product Data Sheet:</b>	<b>NO</b> <input type="checkbox"/> <b>YES</b> <input checked="" type="checkbox"/>
<b>Changes to Subscription Contract:</b>	<b>NO</b> <input type="checkbox"/> <b>YES</b> <input checked="" type="checkbox"/>
<b>Changes to Interface:</b>	<b>All</b> <input type="checkbox"/> <b>Quantinuum API</b> <input checked="" type="checkbox"/> <b>Microsoft</b> <input type="checkbox"/>
<b>Description and Purpose:</b>	<p>The purpose of this notification is:</p> <ol style="list-style-type: none"><li>1) Notify customers that the Helios quantum computer will become commercially available through Nexus to current customers with access to system model H2.</li><li>2) Notify customers that Helios-1E, Helios-1SC and Selene endpoints will be available through Nexus to support the release of the Helios QPU.</li></ol> <p>See additional information below for more details.</p>
<b>Reason / Motivation for Change:</b>	<p>The Helios quantum computer will be available to subscription holders whose subscriptions allow access to Helios on November 5th. In addition to the release of the Helios QPU new endpoints will be released for resource estimation, debugging, and emulation.</p>
<b>Action Required by Customers:</b>	None

### Additional Information:

Helios is the first release of our third-generation quantum computer. This will be available for users on November 5th. It operates based on qubits implemented through atomic hyperfine states of  $^{137}\text{Ba}^+$ . The Helios generation will start with Helios-1, which has 98 physical qubits (ions) that move, individually or in pairs, between eight interaction zones where all quantum operations (initialization, measurement, single-, and two-qubit gates) are performed using lasers.

As with past Quantinuum QPUs, Helios will be continuously upgraded over its product lifecycle. Calendars for Helios' availability are available through the Nexus platform.

### **Helios Features**

- 98 qubit trapped-ion based quantum computers

- All-to-all connectivity
- Low noise Laser based quantum gates
- Quantum charge-coupled device (QCCD) architecture with eight gate zones in a trap consisting of a single circular storage ring and two linear gating sections
- 8 gate zones for parallel single qubit operations and 4 parallel gate zones for two qubit operations.
- Ultra-low crosstalk with mid-circuit measurement
- Qubit reuse after mid-circuit measurement
- Native gate set: single-qubit rotations, two-qubit ZZ gates, arbitrary-angle ZZ gates
- Long T2 coherence times (~seconds)
- Real-time conditional logic execution
- Capable of performing real-time error correction

Subscriptions provide access to both H2 and Helios QPUs. Subscriptions do not guarantee an amount of access to either system but provide access to both systems up to the contractual monthly allocation of HQCs. **For circuits that require  $\leq 56$  qubits, Quantinuum strongly encourages users to submit these jobs to the System Model H2 family of QPUs.**

This launch will include three new targets:

- “Helios-1” – Physical hardware
- “Helios-1SC” – Syntax checker
- “Helios-1E” – Helios emulation

Nexus hosted endpoints (billed in CPU time)

- “Helios-1E-lite” – Helios emulation on CPU
- “Selene” – Nexus hosted version of the open-source Selene tool
- “Selene – plus” Nexus hosted version of Selene with additional configuration options

For more details on Quantinuum Helios, please see <https://docs.quantinuum.com/systems/>.

## **Next Generation Stack**

In addition to the release of Helios, Quantinuum is excited to announce our next generation stack including the release of Guppy, Selene, a real time engine for Helios, and the addition of QIR submission support for Nexus enabling third-party application integration such as NVIDIA’s CUDA-Q.

Past Quantinuum systems utilize fixed transport planning from the output of the compilation process. With Helios, quantum programs are run using a runtime environment to control on-the-fly transport planning prior to execution. This new runtime enables unbounded loops and recursive programming, meaning that operations can be guided dynamically by quantum measurements as they occur.

For more details of the next generation Quantinuum stack please see this Quantinuum [blog post](#).

## **Guppy Release**

To facilitate the new features coming with the release of Helios, Quantinum is happy to announce our new application programming language, Guppy. Guppy is a pythonic language designed to be user friendly and enable quick development of new hybrid and dynamic programs enabled by the release of the Helios QPU. Guppy provides native support for real-time feedback and common programming constructs like 'if' statements and 'for' loops enabled by the introduction of the real time engine for Helios.

Documentation for Guppy can be found on Quantinum's [Guppy documentation](#) webpage.

## **Selene Release**

In addition to the release of the Helios quantum computer, Quantinum will also be releasing a new emulation framework named Selene. This new framework provides Quantinum users with the tools to simulate, verify, and debug the new hybrid workflow possible with the Helios family of quantum computers. Selene will also provide users with a new method for estimating the cost of dynamic circuits and properly configuring max cost values for submitted jobs.

Documentation on Selene can be found on Quantinum's [Selene documentation](#) webpage.

## **Dynamic Costing and Max Cost**

With the introduction of new conditional and dynamic features it is no longer possible to return an exact cost of programs before execution. Quantinum will continue to utilize the HQC as a unit of cost for a submitted program but exact cost will only be returned after a circuit has been completed and the total number of operations run is determined. Selene will provide tools for estimating cost and users will be able to specify a max cost for a submitted program. This max cost will be enforced during execution exiting the program once the cost has hit the specified value. Programs that are terminated early will return results for all shots completed before the max cost is exceeded.

Learn more in the [Quantinum Helios costing document](#).