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Product / Process Change Notification
Document: PCN_HSeries_02
Issue Date: March 13, 2022

Title of Change:	Upcoming System Model H1 Emulator updates
Proposed Date of Change:	March 2022
Contact Information:	Technical: Brian Neyenhuis All other: Jenni Strabley
Products impacted	H1-1 and H1-2 emulators
Changes to product data sheet	**NO** ☒ **YES** ☐
Changes to subscription contract	**NO** ☒ **YES** ☐
Description and Purpose:	The purpose of this notification is to: 1) Notify customers that the H1-1 emulator will be upgraded to an N=20 compiler and will now be available for doing emulations with up to N=20 qubits. 2) Notify customers that the H1-2 emulator will be available for simulation of N=12 qubits and uses a detailed error model specific to the H1-2 machine See additional information below for more details.
Reason / Motivation for Change:	Updates to emulator
Action required by customers	None

Additional Information:

1) Notification of H1-1 emulator upgrade to N=20 compiler

Effective March 1, the H1-1 emulator (target: HQS-LT-S1-SIM) was switched from using the 12-qubit compiler to using a 20-qubit compiler. In doing so, the H1-1 emulator can do simulation of algorithms using $N \leq 20$ qubits. The purpose of this change is to allow customers to start developing algorithms with larger numbers of qubits in advance of the H1-1 hardware release with commensurate capabilities. H1-1 hardware is currently in an upgrade to enable 5 zone operations with 20 qubits. Customers will be notified when H1-1 is commercially available with 5 zones and 20-qubit capabilities.

As this is an advance-copy of the H1-1 emulator, users should be aware that the error models used in this upcoming release have not yet been validated on the H1-1 hardware. Full error parameter characterization of H1-1 with N=20 qubits is planned to be released at the end of April. For that reason, customers could experience a larger discrepancy between any simulations and H1-1 hardware for when conducted before the error model upgrade.

As expected, full emulation with larger number of qubits becomes increasingly more computationally intensive as the number of qubits increases. Customer should expect that emulation using the larger number of qubits require longer compute times and likely longer queued times.

Batching and fair-queueing is enabled on the emulator; just like the H1-1 hardware.

In summary, the impact to customers of launching 20-qubit H1-1 emulator is:

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- Customers will have early access to a new compiler that can support $N \leq 20$ qubits. This is included in your current emulator access. Emulators are nominally available 24/7.
- The noise model for this early release has not been validated on the hardware. Validation will occur in April and released late April. In the interim, customers may see a larger than typical discrepancy between emulations and H1-1 hardware performance.
- Emulation with larger number of qubits will be slower than emulation with fewer qubits.

2) Release of H1-2 emulator

Effectively immediately customers will have access to a 2nd emulator that uses error parameters specific to and validated on the H1-2 machine. The new H1-2 emulator target is HQS-LT-S2-SIM. The H1-2 emulator and hardware will continue to use the N=12 compiler until further notice. There is no change to H1-2 hardware as part of this product change notification.

In summary, the impact to customers of the H1-2 emulator release

- Customers will have access to emulator that has error parameters specifically characterized for the H1-2 hardware. The ability to use this emulator is included in your access. Emulators are nominally available 24/7.