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Embracing the accelerator computing revolution at SLAC

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We face a number of challenges in planning future controls and computing for large accelerator facilities. Online tuning increasingly requires 6-d phase space customization, fast numerical estimation methods, and space-charge modeling in timescales relevant to operations. The needs are being met by advances in machine learning, artificial intelligence and the proximity of multi-particle methods to accelerator operations, whose outcomes must be deployed to effectively change how we do accelerator physics and experiment optimization. This imperative, along with cyber and technical debt mitigation, are driving changes in architecture - in controls to add high performance and edge computing, in data systems to add high fidelity and vector databases, and in networks to interconnect these, and add security and throughput. At the same time, the data from devices gets larger, and more complicated, requiring new data structures, and new control primitives that incorporate data semantics. These changes are happening in the face of increased funding pressure. However, there are also more tools at our disposal and technologies from web, streaming and internet we embrace to help. We present these drivers, our vision of an integrated response, the path we're on, architectures and data systems in development to support the new physics techniques and tools, and our roadmap for the next few years.

Footnotes

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Authors: EDELEN, Auralee (SLAC National Accelerator Laboratory); JACOBSON, Bryce (SLAC National Accelerator Laboratory); ZIMMER, Christopher (SLAC National Accelerator Laboratory); Mr WILLIAMS, Ernest (SLAC National Accelerator Laboratory); WHITE, Greg (SLAC National Accelerator Laboratory); DALESIO, Leo (EPIC Consulting); GIBBS, Matt (SLAC National Accelerator Laboratory); ZELAZNY, Michael (SLAC National Accelerator Laboratory); HERBST, Ryan (SLAC National Accelerator Laboratory); SUMMERS, Tasha (SLAC National Accelerator Laboratory)

Presenter: WHITE, Greg (SLAC National Accelerator Laboratory)

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