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# Applications Of Blockchain Technology Distributed Computing In High Energy Physics

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The HEP software community has identified scalability, complexity, and cost as barriers to advancing high-performance computing in high-energy physics. We intend to address these issues by pulling technology from other domains, such as artificial intelligence, traditional financial technology, web3, and blockchain. By combining computational systems from other domains with existing HEP software, the HEP software community can share costs, pool resources, and aggregate computation power with other computational domains addressing these issues.

In this talk, we will describe the current status and design of our blockchain system which leverages existing open source software technology and web3 for generalized high-performance computing and its application to high energy physics and AI. Our computational infrastructure using comprises a decentralized blockchain system that passes messages between computational nodes, implemented as docker/OCI containers. We use an the end-to-end principle to place policy controls at the endpoints, drastically simplifying computational complexity and removing barriers to international resource sharing between institutions and professional domains.

To support HEP workflows, we are integrating the streaming network with a computational node that uses the Key4Hep framework to include software commonly used in HEP, such as ROOT, Gaudi, and Podio. We have designed the system to allow easy integration with software-as-a-service systems such as AI providers such as ChatGPT or OpenLllama. We have designed the system to be scalable both upward, allowing the creation of computational networks of the scale of the Bitcoin computation network, and downward, allowing the creation of simple ad hoc distributed computation systems. An open-source prototype of our work is available on GitHub, and we are seeking users and developers from the HEP community.

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