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Collaborative Technologies for Distributed Science - Fusion Energy and High-Energy Physics

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The large-scale experiments, needed for fusion energy sciences (FES) and high-energy physics (HEP) research, are staffed by correspondingly large, geographically dispersed teams. At the same time, theoretical work has come to rely increasingly on complex numerical simulations developed by distributed teams of scientists and applied mathematicians and run on massively parallel computers. These trends will only accelerate. Operation of the most powerful accelerator ever built, the Large Hadron Collider at CERN, will begin next year and will dominate experimental high-energy physics. The fusion program will be increasingly oriented toward the ITER where even now, a decade before operation begins, a large portion of national programs efforts are organized around coordinated efforts to develop promising operational scenarios. While both FES and HEP have a significant track record for developing and exploiting remote collaborations, with such large investments at stake, there is a clear need to improve the integration and reach of the tools available.

These challenges are being addressed by the creation and deployment of advanced collaborative software and hardware tools. Grid computing, to provide secure on-demand access to data analysis capabilities and related functions, is being deployed as an alternative to traditional resource sharing among institutions. Utilizing public-key based security that is recognized worldwide, numerous analysis and simulation codes are securely available worldwide in a service-oriented approach. Traditional audio teleconferencing is being augmented by more advanced capabilities including videoconferencing, instant messaging, presentation sharing, applications sharing, large display walls, and the virtual-presence capabilities of Access Grid and VRVS. With these advances, remote real-time experimental participation has begun as well as remote seminars, working meetings, and design review meetings. Work continues to focus on reducing the variety of remote participation methods, on improving interoperability between the different approaches, on ease of use, and on improved security.

This paper will compare the requirements of FES and HEP, discuss today’s solutions, examine areas where more functionality is required, and discuss those areas with sufficient overlap in requirements that joint research into collaborative technologies will increase the benefit to both

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