

## THE DIII-D COMPUTING ENVIRONMENT: CHARACTERISTICS AND RECENT CHANGES\*

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The DIII-D tokamak national fusion research experiment along with its predecessor Doublet III has been operating for over 21 years. The DIII-D computing environment consists of real-time systems controlling the experiment, heating systems, and diagnostics, and systems acquiring experimental data from instrumentation; major data analysis server nodes performing short term and long term data access and data analysis; and systems providing mechanisms for remote collaboration and the dissemination of information over the world wide web. Computer systems for the experiment have undergone incredible changes over the course of time as the computer industry has changed so dramatically. Yet there are certain valuable characteristics of the DIII-D computing environment that have been developed over time and have been maintained to this day. These characteristics include: continuous overall growth of computing systems as the quantity of acquired data, the number of users, and the mechanisms for analysis has continued to increase; continuous upgrades of systems to handle more data and new capabilities; providing general CPU cycles to both onsite and offsite users; continuous network upgrades; the ability to integrate other computing platforms than the norm into the DIII-D environment; a highly distributed computer network with distributed data access leading to a high degree of data availability; independence of user location and data location via PTDATA access; data signals available to user inspection and analysis as soon as initially written to disk; compression of raw data to reduce disk space usage and reduce network traffic; availability of data to remote access via a connection to the wide area network; computer feedback control of the plasma shape; involvement in remote collaborations; and use of IDL as a common data analysis tool. These characteristics are being carried forward as well as new characteristics resulting from recent changes which have included: network upgrades to switched Fast Ethernet; replacement of old VMS systems and elimination of others; upgrades of the central computing system as well as workstations; upgrades of control and data acquisition systems; a large central file storage server; a dedicated storage system and a hierarchical storage management system for raw shot data; improvements to remote collaboration capabilities as computer systems at remote sites are playing an increasing role both in accessing and analyzing data; the development of common tools for interacting with data; and the introduction of MDS+ and LSF to more effectively utilize the computing environment. This paper will describe this computing environment, important characteristics that over the years have contributed to the success of DIII-D computing systems, recent changes, and configuration and data flow within the environment.

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