The DIII-D tokamak fusion research experiment real-time digital plasma control system (PCS) is a complex and ever evolving system during a plasma experiment. It is tasked with some of the most crucial functions at DIII-D. Key responsibilities of the PCS involve sub-system control, data acquisition/storage, and user interaction. To accomplish these functions, the PCS is broken down into individual components (both software and hardware), each capable of handling a specific duty. Constant interaction between these components is necessary prior, during, and after a standard plasma cycle. Complicating the matter even more is that some components, mostly those which deal with user interaction, may exist remotely, that is to say they are not part of the immediate hardware which makes up the PCS.

The four main objectives of this paper are to 1) present a brief overview of a standard DIII–D plasma cycle (“a shot”) and some of the tasks the PCS is responsible for; 2) present a brief outline of the various aspects of the PCS and how they relate to each other; 3) using a single sub-system of the PCS, describe in detail the communication process; 4) evaluate the benefits and drawbacks of the systems.

*Work supported by U.S. Department of Energy under Contract No. DE-AC03-99ER54463.