

Architectures for Collaborative Virtual Prototyping

ABSTRACT: Virtual Prototyping (VP) is a relatively new technology which involves the use of Virtual Reality (VR) and other computer technologies to create digital prototypes. Recently, this rapidly expanding technology has matured enough to warrant serious consideration as part of the engineering design and manufacturing process. Virtual prototyping has extended beyond the specific use of virtual reality to now include the use of next-generation Computer Aided Engineering (CAE) technologies including advanced visualization systems, human modeling systems, and CAD/CAM systems. The emergence of these systems has raised significant concern regarding the integration and concurrent use of these tools. As the use of next-generation CAE systems becomes more prevalent, engineers will continue to grapple with how, when, and where to properly use these tools in the engineering design cycle. The abundance of data generated and used by these systems places considerable burden on the engineer, who often ends up spending more time on data and process management (e.g. transferring data from system to system, version control, system integration, etc.) rather than on the actual design problem. As these systems continue to become mainstream, the burden placed upon the engineer using these systems must be alleviated. The effective use of these tools in an integrated, synergistic fashion has not yet been realized. This paper discusses a number of distinct approaches for creating a collaborative, distributed architecture for virtual prototyping. The architectural philosophies discussed include: Product Development Approach, CAE Tool Integration Approach, User-session Approach, Functional Approach, and Black-box Approach. A final architecture, created from the value-added features of each of the discussed philosophies, was created. A prototype implementation of this architecture and its underlying technological infrastructure is briefly discussed.