

VIRTUAL ACCELERATOR: GRID-ORIENTED SOFTWARE FOR BEAM ACCELERATOR CONTROL SYSTEM

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The key idea of the Virtual Accelerator (VA) concept is a modeling of beam dynamics with help of several software packages, such as COSY Infinity, MAD, etc., composed in pipelines and enacted on grid-enabled distributed computing resources.

The main use of the VA is simulation of beam dynamics by different packages with the opportunity to match the results (in case of using different solution methods for the same problem) and the possibility to create pipelines of tasks when the results of one processing step based on a particular software package can be sent to the input of another processing step.

The VA is considered as information and computing environment and does not refer to real-time control systems. However, real-time control can be provided by connection to specialized software (e.g. Experimental Physics and Industrial Control Systems – EPICS). Such kind of VA is examined in [1] and [2] where authors emphasize on accelerator control development.

The general idea of the software implementation is based on the Service-Oriented Architecture (SOA) that allows using grid and cloud computing technologies and enables remote access to the information and computing resources. Distributed services establish interaction between mathematical models and low-level control system.

The VA user interface allows getting solutions both from simulation models and from real accelerator machines. This approach gives researchers ability for system identification, parameter optimization, and result verification, which is impossible without computational models. The same approach to develop a virtual laboratory is discussed in paper [3] for nuclear physics applications.

The LEGO paradigm is used for the VA design. In terms of information technology it corresponds to object oriented design and component programming. Each object is represented as an independent component with own parameters and behavior. In paper [4] the development of distributed computing systems based on this concept is examined in more detail.

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