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Web Platform for Sharing Modeling Software in the Field of Nonlinear Optics

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We present a web platform intended for sharing of software programs for computer modeling of nonlinear optics phenomena. Nonlinear optic is a rapidly evolving area of modern physical research and engineering with many important applications such as fiber-optic communications, nonlinear spectroscopy, diagnostic of non-stationary and inhomogeneous processes in plasma and gas phases, laser biomedicine, etc. Successful development of optical devices requires complicated modeling of physical processes that occur in components of devices and comprehensive database of optical properties of used materials (see e.g., [1]). Many developers of application software, including those for computer modeling, have the intention to share their products for use by other researchers. However, individual developing and maintaining hardware and software infrastructure supporting the delivery of a product is disadvantageous from a financial point of view and from the point of view of time spent on its creation. Therefore, a very important task is to develop a web platform where users of application software, presented in the form of web services, and their providers be able to directly interact.

The suggested platform is build on the top of the HUBZero open-source middleware (http://hubzero.org) [2]. It provides services for application software installation and includes a set of tools for simplifying the interaction between the software developers and resource administrators. In particular, the platform comprise tools for transforming application software (with allowance for certain rules for API) into software as aservice (SaaS). It also provides facilities for supporting communities of users (including on-line seminars, network conferences, storages of domain-specific information, etc.). General architecture of the web platform have the three-layer architecture. The first layer is the frontend that provides the user web interface; the second layer consists of the platform engine responsible for job submitting, obtaining results, the system of remote software deployment, the administration system (responsible for user management, tool configuration, etc.); the third layer is a resource manager that exposes data and compute resources to the preceding layer. The web platform uses the technology of virtual machines [3], which provide both security (software isolation) and an operating system required for a given application software. Users can interact with the platform through the web browser interface.

Such a resource has no analogues in the field of nonlinear optics and will be created for the first time, therefore allowing researchers to access high-performance computing resources that will significantly reduce the cost of the research and development process.

References

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Author: Ms DUBENSKAYA, Yulia (SINP MSU)

Co-authors: Dr KRYUKOV, Alexander (SINP MSU); Dr DEMICHEV, Andrey (SINP MSU)

Presenter: Ms DUBENSKAYA, Yulia (SINP MSU)

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