Development of a System Generator for Marsohod Development Boards

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When working with development boards based on FPGA and system-on-chip design, it is necessary to set up the project within the framework of the tasks assigned. The automation of this task contributes not only to reduction in time for commencement of work on a project, but also to decrease in the number of potential problems and mistakes by eliminating the need to go into peculiarities of working and specifics of realization of development boards.

Many manufacturers create their own tools for making custom preconfigured projects for their boards. For example, Terasic Company with each of their development boards provides special programs (system generators) on its website. They make it possible to choose which modules should be integrated into the project. Each board requires its own generator which has to meet the requirements of software portability and be supported by different operating systems. In addition, existing system generators are limited by the existing periphery and functionality of development boards only; they cannot integrate additional modules or common add-ins into the project.

Many boards of less advanced manufacturers (such as Marsohod family, manufactured by the Russian company "Inpro Plus"), do not have system generators at all. This work is aimed at decreasing the entry threshold and reducing the time required to create projects using Marsohod boards by automation of initial configuration process, which will also make it easier to study FPGA design. The developed solution is suitable for executing projects which do not require a specific configuration and allows obtaining configuration files and preconfigured projects for development boards of Marsohod family.

Another feature of developing systems-on-chip, based on FPGA, is a lack of online development tools, such as, for example, 3D design tools provided by Autodesk. The best that exists can be referred to online compilation and modeling tools for HDL having rather limited functionality. So, developers are severely lacking some convenient tools and capabilities provided by desktop CADs, for example, "Altera Megafunctions" for adding IP functions, or "Platform Designer" for NIOS II soft-processor core configuration.

The developed system is implemented as an online service, which is one of its major advantages, since it allows uniting all system generators for different boards by a single interface. As a result, generation of configuration files becomes as easy as possible due to no need to install the application. The developed software solution has the feature to add additional modules, such as UART, on-chip RAM, etc.; moreover, it has also been added an online configurator for a simple processor core schoolMIPS, as well as the tools for generating a network-on-chip with various topologies on its base. The kernel of the system was created with Python 3 using the Flask web-framework and the Jinja2 template engine.

The configuration files were tested in CAD Quartus Prime 15+. This ensures that the created projects will be supported by various modern CAD versions for the development of projects on Marsohod boards based on CPLD / FPGA. The developed solution has a convenient and intuitive user interface, and the main work on configuration takes place on the server side. The server part is covered with functional tests, and the user interface was tested in browsers based on Chromium 50+ and in Internet Explorer 11, which guarantees support of the developed application by most modern browsers.