

Logic Architecture is in 3D

reconfigures logic, memory and interconnect

Tabula, a privately held fabless semiconductor company, has introduced a programmable logic architecture that uses time as a third dimension. The company says that, compared to 40nm FPGAs, a 40nm Spacetime device delivers 2.5 times the logic density, two times the memory density, 2.9 times higher memory ports and four times higher SP performance. The hardware dynamically reconfigures logic, memory, and interconnect on the fly at multi-GHz rates, executing each portion of a design in an automatically defined sequence of steps. This is combined with the Spacetime compiler that manages the ultra-rapid reconfiguration transparently to deliver 3D devices that are significantly denser and shorter interconnects when compared to FPGAs that use 2D architectures, according to the company. It claims that the traditional design methodology allows it to be used for programmable devices that combine the capability of an ASIC with the ease of use of an FPGA, at price points suitable for volume production. The architecture's shortened interconnects are based on the premise that almost 90% of the core area of FPGAs is

devoted to the implementation and control of the interconnect. Long connections drive up die size and cost as well as limiting performance and make timing closure more difficult. The architecture is manufactured using a standard CMOS process, the reconfiguration makes time a third dimension, resulting in a 3D device with multiple layers, or folds, in which computation and signal transmission can occur. Each fold performs a portion of the desired function and stores the result in place. When some or all of a fold is reconfigured, it uses the locally stored data to perform the next portion of the function. By rapidly reconfiguring to execute different portions of each function, a device can implement a complex design using only a small fraction of the resources that would be required by an inherently 2D FPGA. The company has over 80 patents granted around the Spacetime architecture with over 70 more pending. The company has declared that it is developing a family of general-purpose 3D PLDs based on the architecture.

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