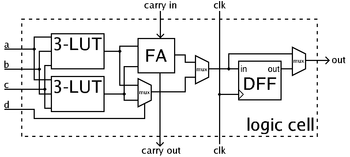
A field-programmable gate arrays are  integrated circuits designed to be  re-programable to the customer/user, hence the name "field-programmable" Before going into the definition of Field-programmable gate array, we first need to understand what exactly Field-programmable gate array are built out of. They are built out of logic blocks or configurable logic block (CLB). A typical cell comprised of a 4-input look up tables (LUT), a multiplexor, a Full adder (FA) and a D-type flip-flop shown by the image below. The LUTs are in this figure split into two 3-input LUTs.  In normal mode those are combined into a 4-input LUT through the left mux. In arithmetic mode, their outputs are fed to the FA. The selection of mode is programmed into the middle multiplexer. The output can be either synchronous or asynchronous, depending on the programming of the mux to the right, in the figure example. In practice, entire or parts of the FA are put as functions into the LUTs in order to save space.



Back to Field-programmable gate array, unlike application-specific integrated circuit (ASIC) which are used to process one task or tasks, Field-programmable gate array are reprogrammable. This in turn makes Field-programmable gate array more flexible allowing changes after manufacturing unlike ASIC.  Field-programmable gate array are a matrix of CLBs. These CLBs are connected through "reconfigurable interconnects" which allow commutation with each other. Field-programmable gate array also have Input/output blocks allowing external connections for the Field-programmable gate array and carry signals into or out of the Field-programmable gate array. Field-programmable gate array also contains fixed-function blocks such as multiplier or digital signal blocks and block RAM that is the main storage for the Field-programmable gate array and is consists of flip-flops tied together.

Field-programmable gate array have many advantages such as performance. They perform faster with parallel processing of signals unlike which can be difficult for some processors because most are sequential. Furthermore, they are far more flexible in comparison because they are reprogrammable which can save on manufacturing costs when there are programming errors. This in turn makes Field-programmable gate array to be used in a wide arrays of functions such as aerospace and defense, audio processing, medical devices, automotive cars, security systems, video and image processing, wireless commination, even in ASIC prototyping and much much more.