Reconfigurable Logic

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Agenda

- Introduction
- What is reconfigurable logic?
- How does it work?
- Uses
- Limitations

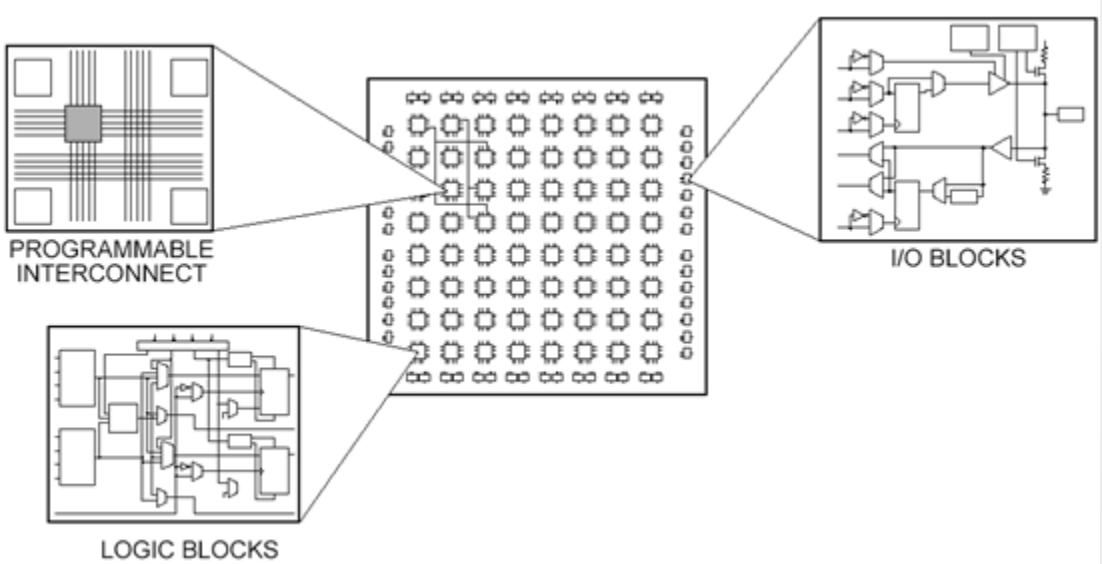
Reconfigurable Logic

- First proposed in 1960s by Gerald Estrin
- Any die that can be programmed outside of the production facility
- Commonly known as Field Programmable Gate Arrays (FPGA)

Configuration

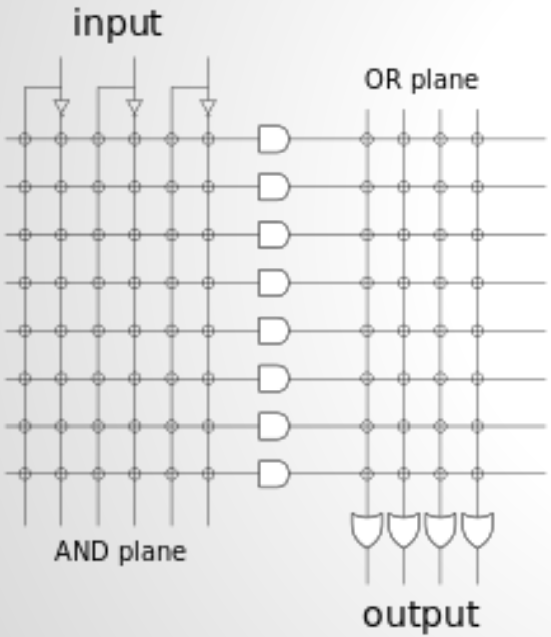
- Fuse-based FPGA
  - Logic is written using fuses and antifuses
  - Can only be written once
- Stored configuration
  - Volatile or non-volatile
  - Can be written multiple times

Implementation



Logic Blocks

- Array based programmable logic
  - 2 level sum of products
  - Works well for combinational logic
  - Low density and performance
- Cell-based
  - Mux as a function generator
  - Lookup Table



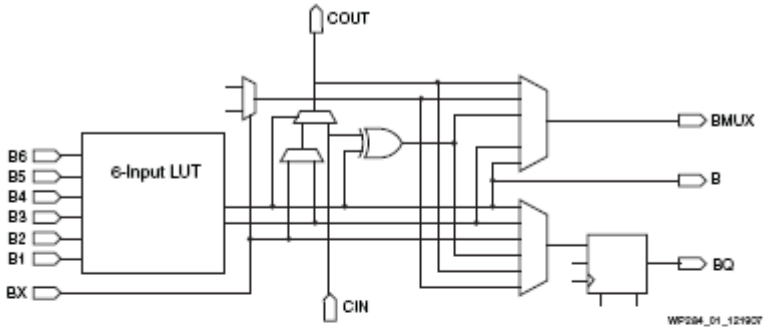


Figure 1: **Virtex-5 FPGA 6-Input LUT Architecture**

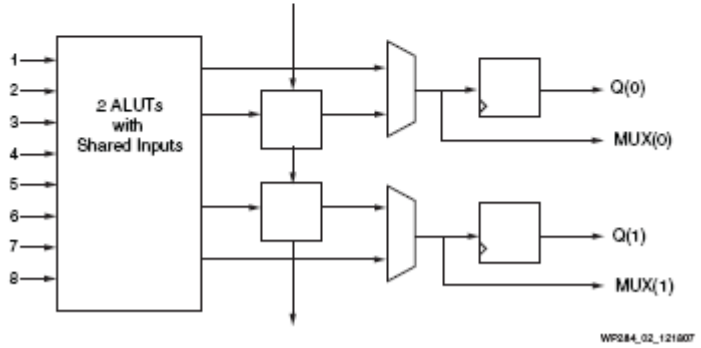


Figure 2: **Stratix III ALM Architecture**

Advantages of FPGA's

- Prototyping
- Cheaper than ASICs in small quantities
- Variable
- Can outperform some general purpose processors

Limitations of FPGA's

- Performance
- Complex designs and implementations
- Requires specific knowledge to program

Sources

- Rabey, Jan M., Anatha Chandrakasan, and Borivoje Nikolic. *Digital Integrated Circuits: A Design Perspective.* 2nd ed. Prentice Hall, 2006.
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- http://www.globalspec.com/reference/10159/132022/white-paper-advantages-of-the-virtex-5-fpga-6-input-lut-architecture

- Todman, T.J., P.Y.K. Cheung, et al. "Reconfigurable computing: architectures and design methods." *IEE Proceedings-Computers and Digital Techniques*. 152.2 (2005)
- Stit, Greg. “Are Field-Programmable Gate Arrays Ready for the Mainstream?” *IEEE Micro.* 31.6 (2011)

Questions?