Outline for Today

- Review of Digital Logic (done ;-)
- FPGA Device Details
- Online Demo
  - Linux: Filesystem and commands
  - More on using Xilinx Platform Studio (XPS)
- System Architectures with FPGAs

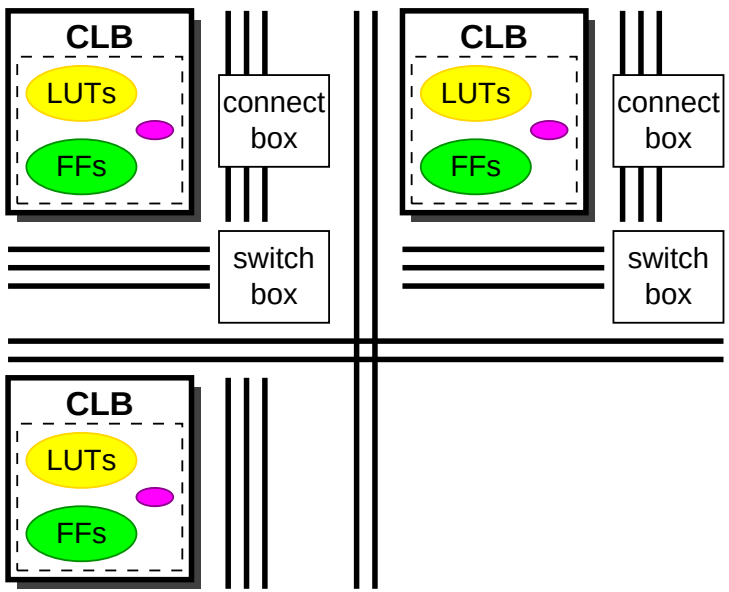
FPGA Devices

Or, *Creating the illusion of virtual hardware.*

FPGAs

Most reconfigurable computing systems use SRAM-based Field-Programmable Gate Array (FPGA) devices.

FPGAs composed of ...



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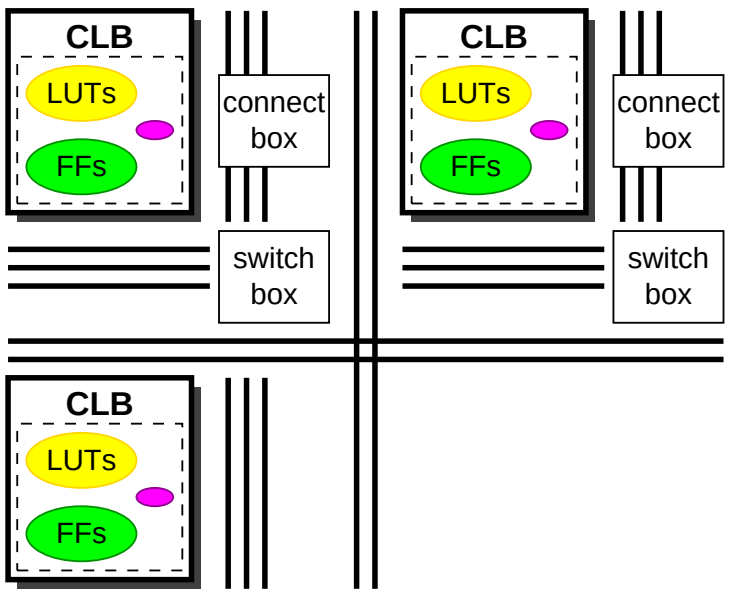

FPGAs composed of ...

- array of configurable logic blocks

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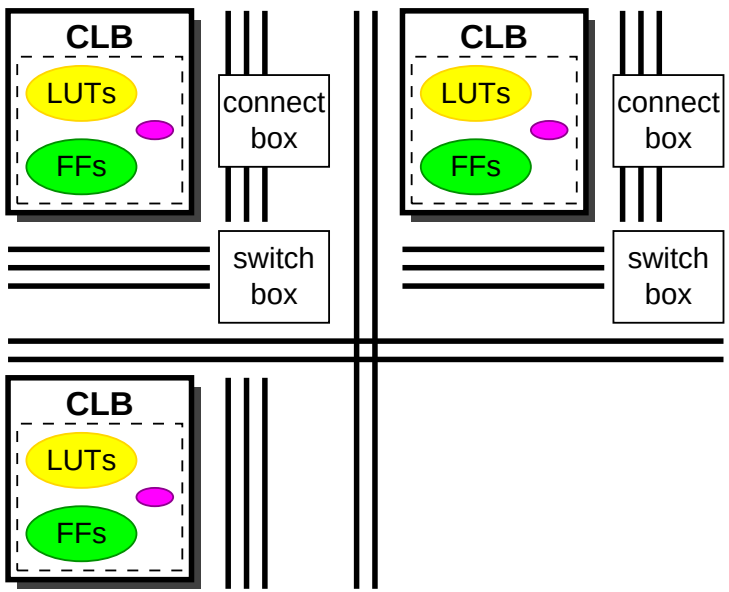

FPGAs composed of ...

- array of configurable logic blocks
- I/O blocks

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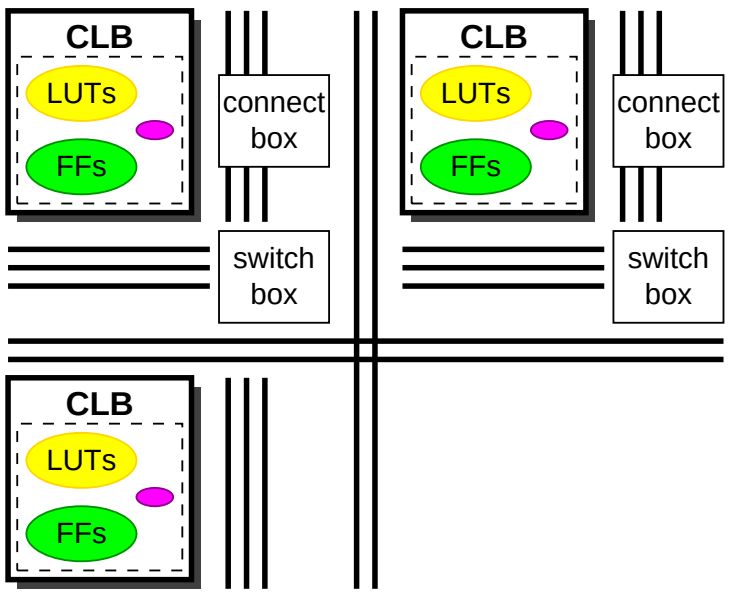

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- I/O blocks
- routing network

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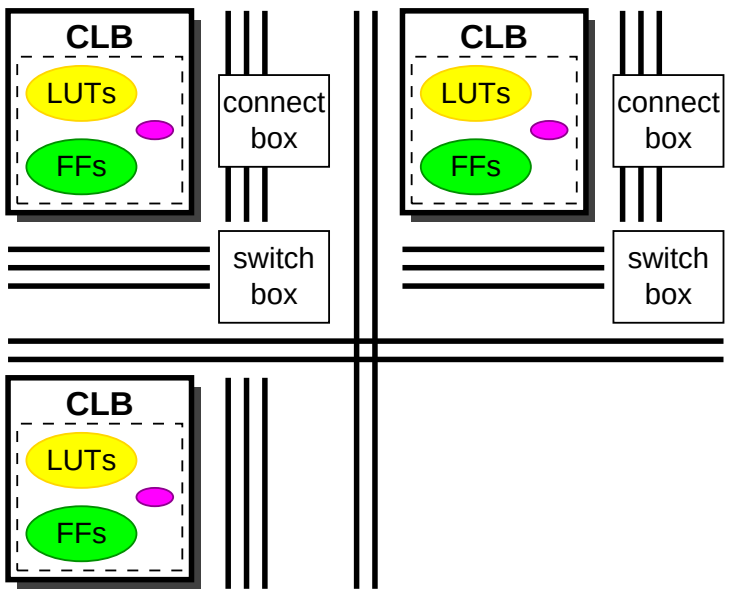


FPGAs composed of ...

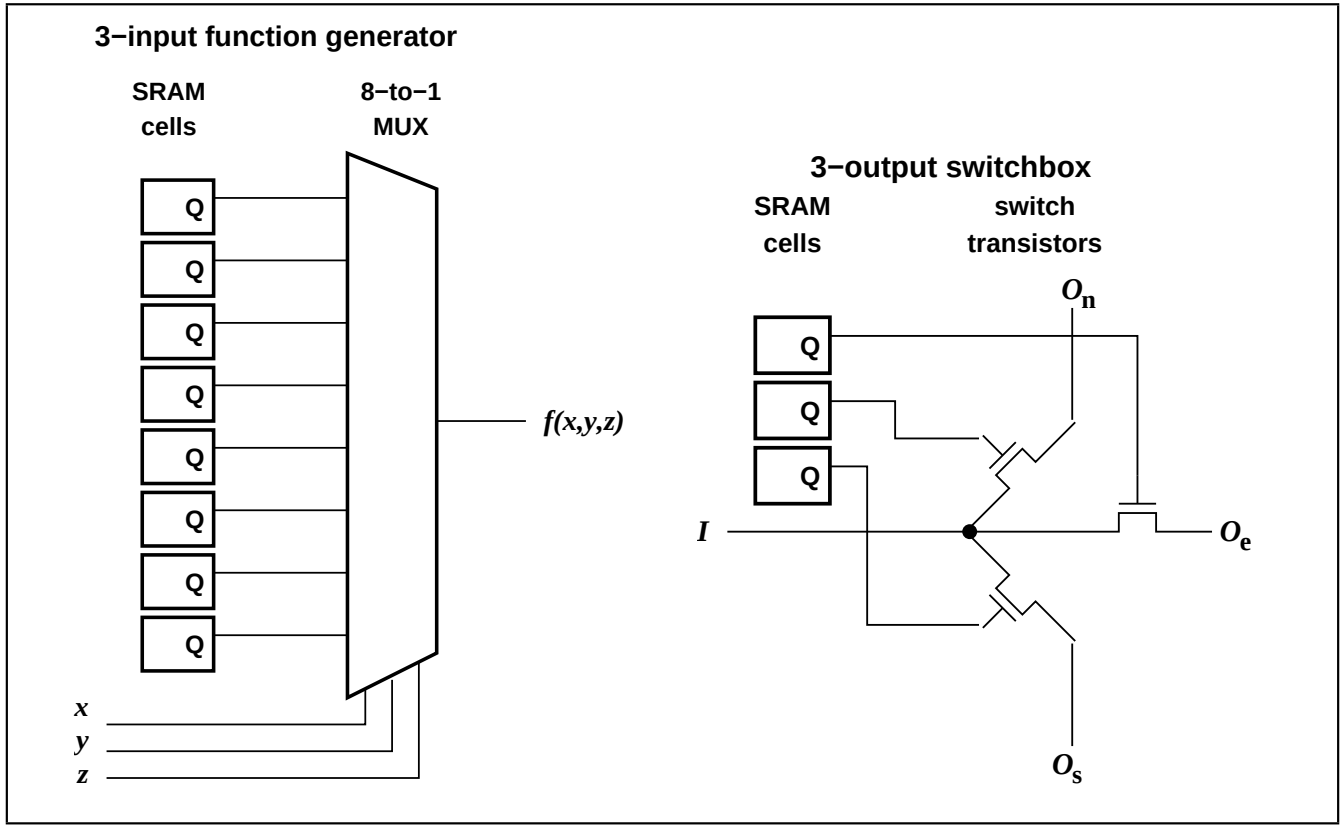
- array of configurable logic blocks
- I/O blocks
- routing network
- special-purpose blocks

FPGAs (cont'd)

- Configurable Logic Blocks
  - Look-Up Tables (LUTs) serve as function generators
  - Flip-Flops (FFs) hold state
  - special-purpose circuitry

  allows for arbitrary combinational and sequential machines
- I/O blocks:
  support a number of electrical signaling I/O standards
- Routing Network:
  connect boxes, switch boxes, "short cuts"
- special-purpose blocks:
  processors, block RAMs, multipliers, transceivers, *et al.*

Reconfigurability



Configuration Plane

- FPGA chip can been viewed as having two logical planes
  - array of CLBs, routing, special-purpose blocks on one plane
  - array of SRAM cells on a configuration-plane
- these two planes intersect at a number of places
  - SRAM cells configure functionality of the CLB-plane
  - SRAM cells for the LUTs can be configured as a RAM or a shift register
  - Internal Configuration Access Port (ICAP) interfaces the CLB-plane routing resources to the SRAM cells of configuration-plane