MAX 10 - ADC

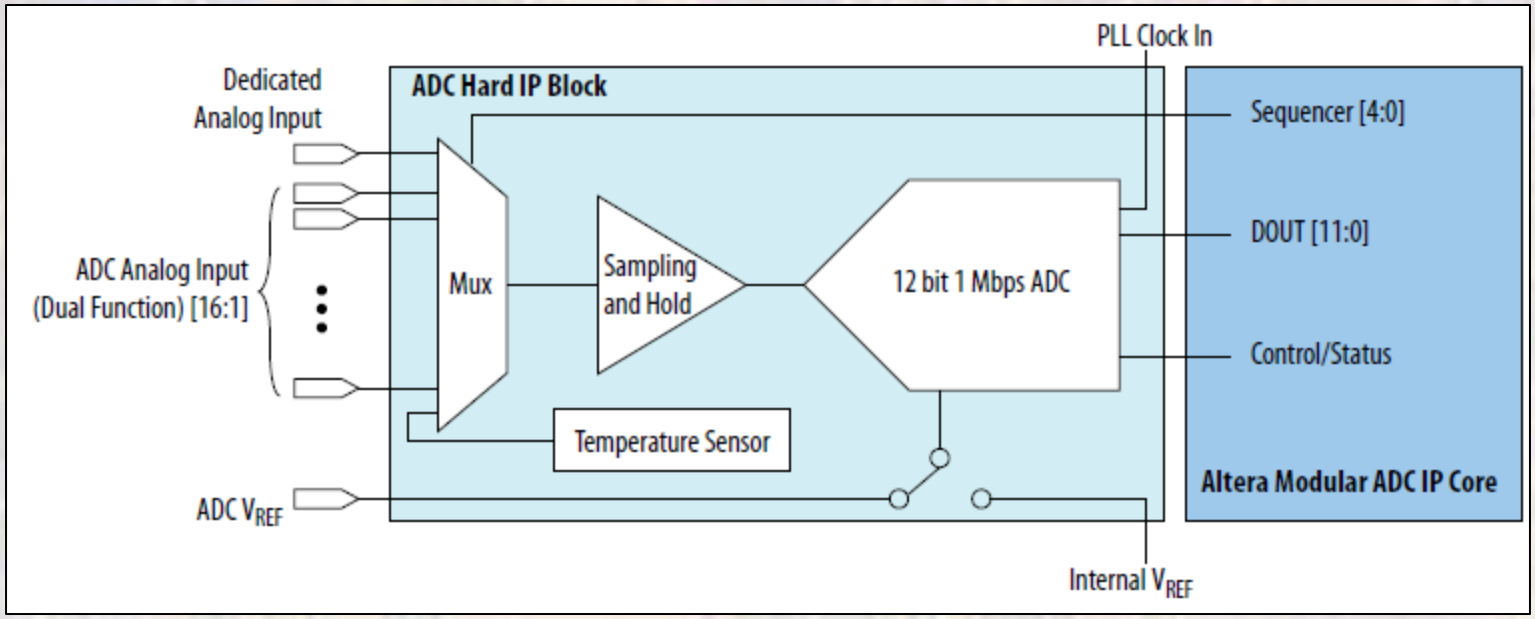
Last updated 7/20/23

Max10 ADC

- ADC Configuration
  - 2 ADC channels
  - SAR type conversion
  - 12 bit conversion
  - 1MHz (max) operation
  - 1 dedicated input / channel
  - 8 programmable inputs / channel
  - 0 – 2.5V conversion range

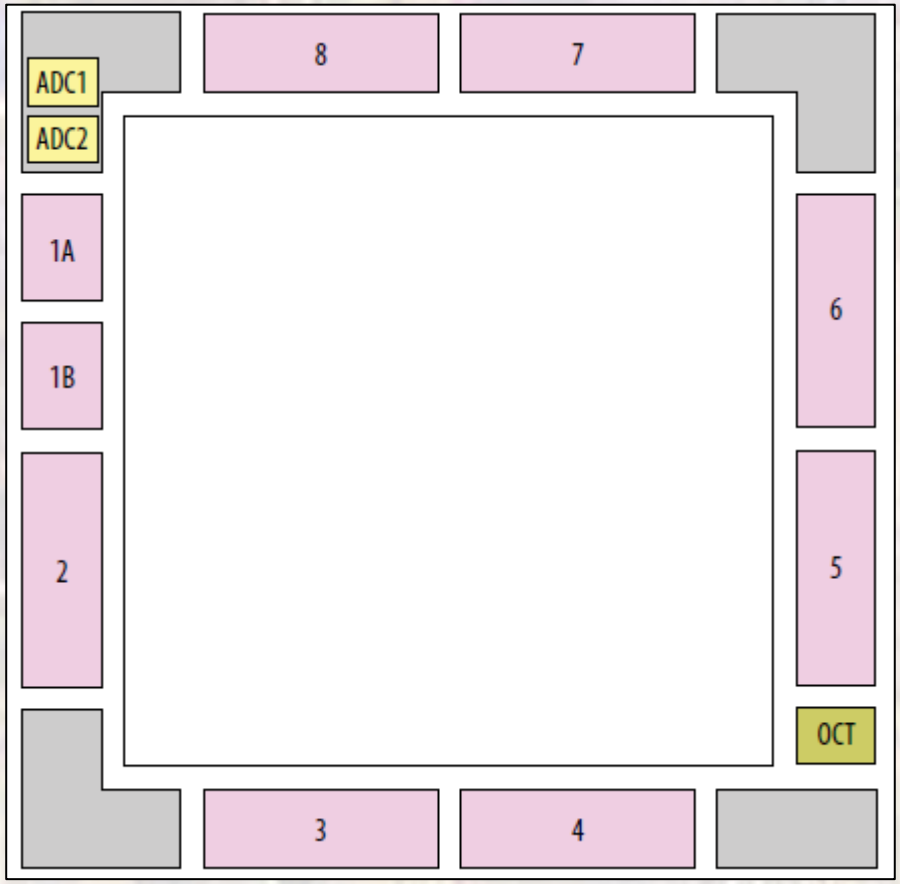
Max10 ADC

- ADC Configuration



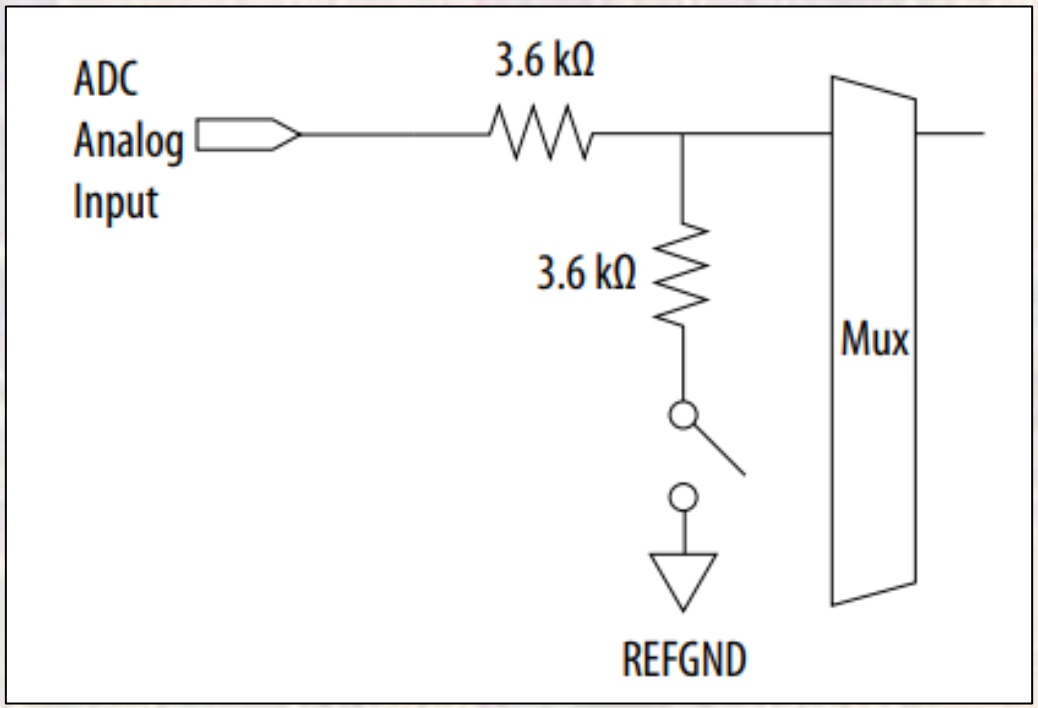
Max10 ADC

- ADC Configuration



Max10 ADC

- ADC Configuration
  - Special Pre-scaler mode for Channel 8
  - Divides input voltage by 2
  - Allows input voltages up to 5V with a 2.5V reference



Max10 ADC

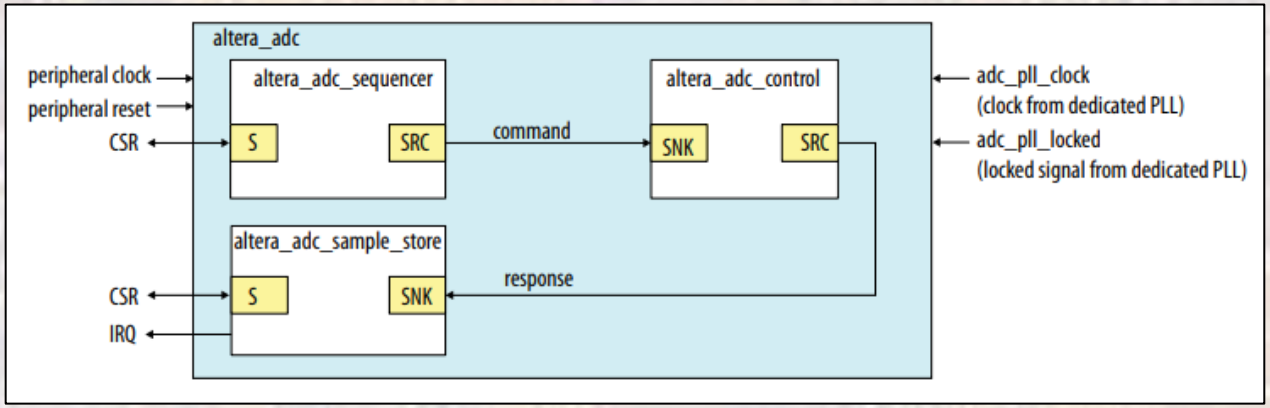
- ADC Configuration
  - Clocking
    - Must use PLL for clocking
    - PLL1 or PLL3
  - Voltage Reference
    - Internal and external reference options
    - Common external reference pin
    - Common internal reference
    - Can select references separately for each ADC
  - Temperature Sensor
    - ADC1 has an on-die temperature sensor

Max10 ADC

- ADC Configuration
  - 2 ADC IP Cores
    - Altera Modular ADC IP core
      - Can use either ADC
      - Both cores can be used at the same time
      - If both cores used – they will operate asynchronously
    - Altera Modular Dual ADC IP core
      - Instantiates both cores
      - ANAIN1 and ANAIN2 inputs are sampled synchronously
      - All other pins are asynchronous

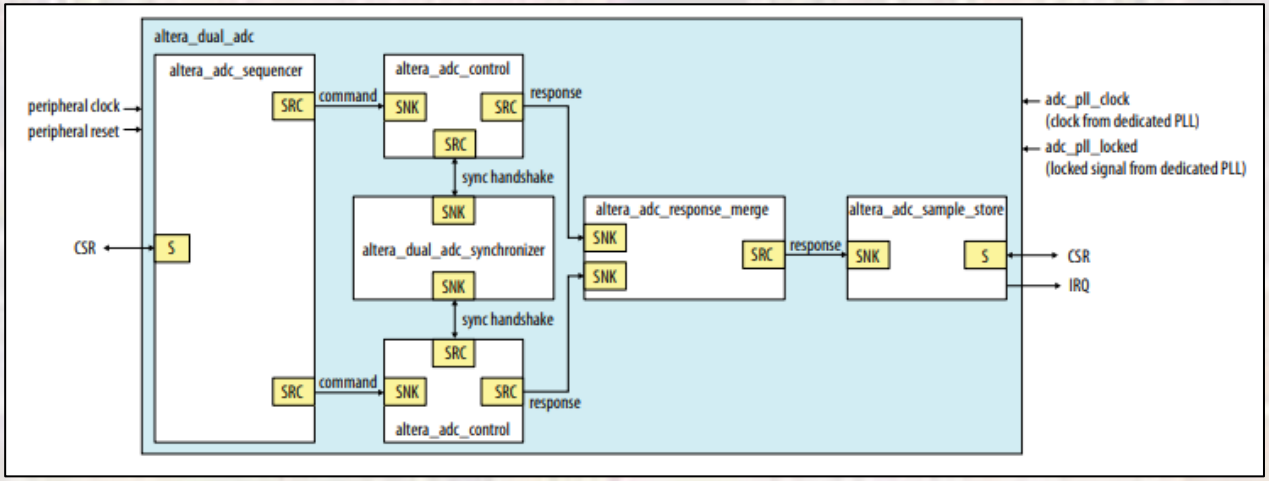
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with Avalon-MM Sample Storage
    - Sequencer manages multiple input pins and sequencing of samples
    - Samples are stored in on-chip memory (Sample Store)
    - Control – controls the process
    - Managed by processor



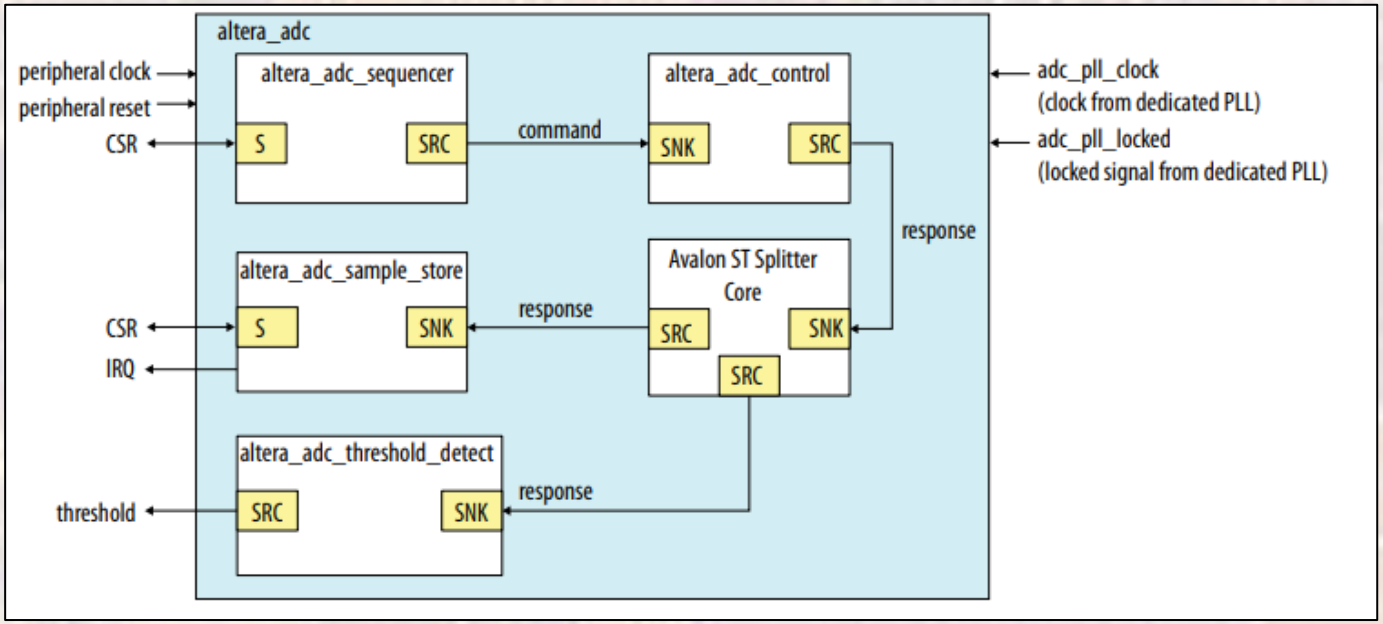
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with Avalon-MM Sample Storage – Dual Core
    - Sequencer manages multiple input pins and sequencing of samples
    - Merged samples are stored in on-chip memory (Sample Store)
    - Control – controls the process independently
    - Managed by processor



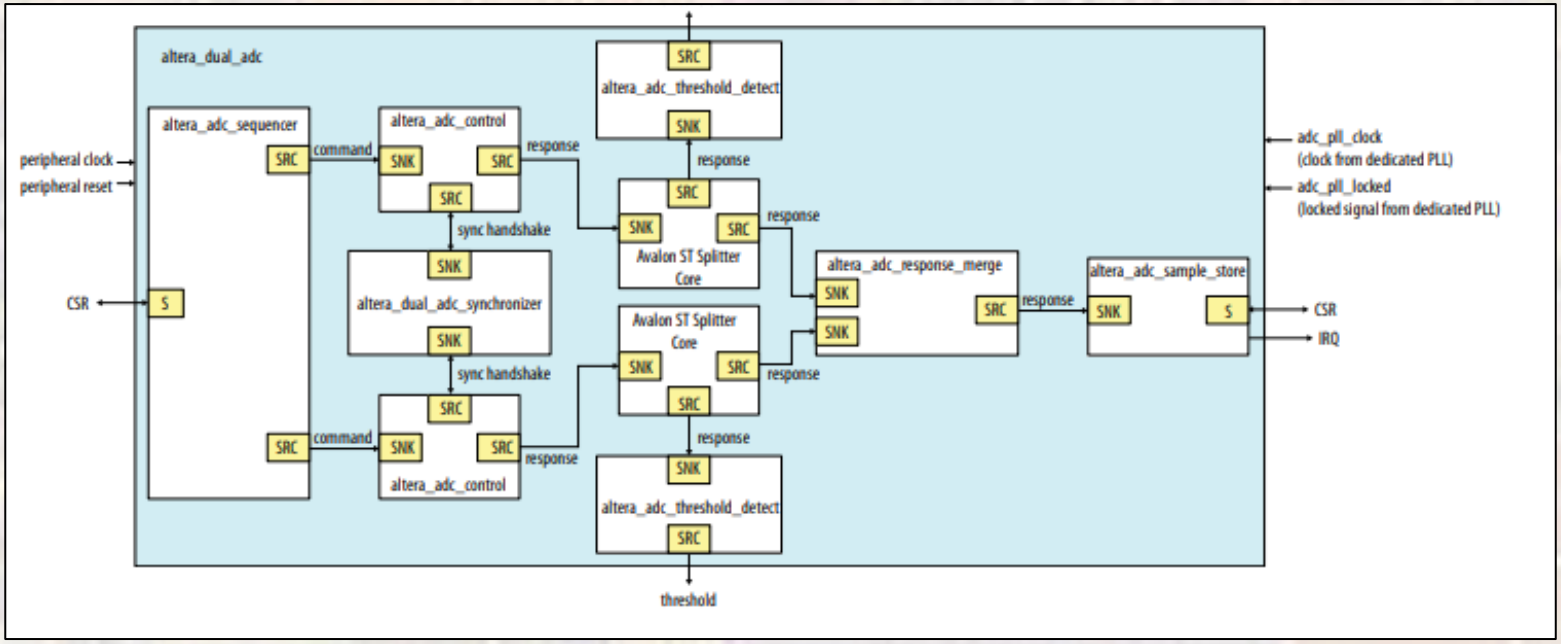
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with Avalon-MM Sample Storage and Threshold Violation Detection
    - Adds a splitter
    - Compares values to thresholds and provides a violation signal



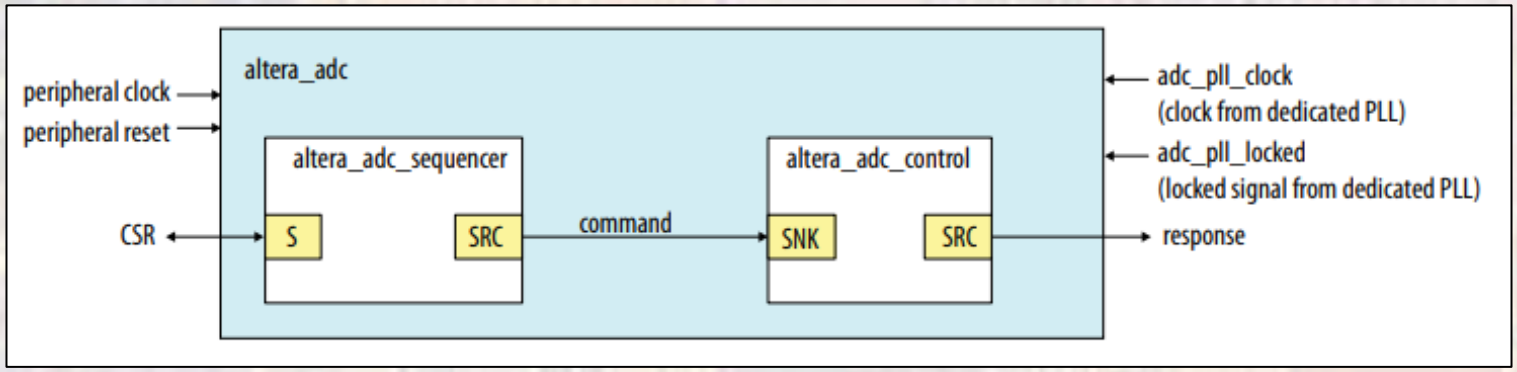
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with Avalon-MM Sample Storage and Threshold Violation Detection – Dual Core
    - Adds a splitter
    - Compares values to thresholds and provides a violation signal



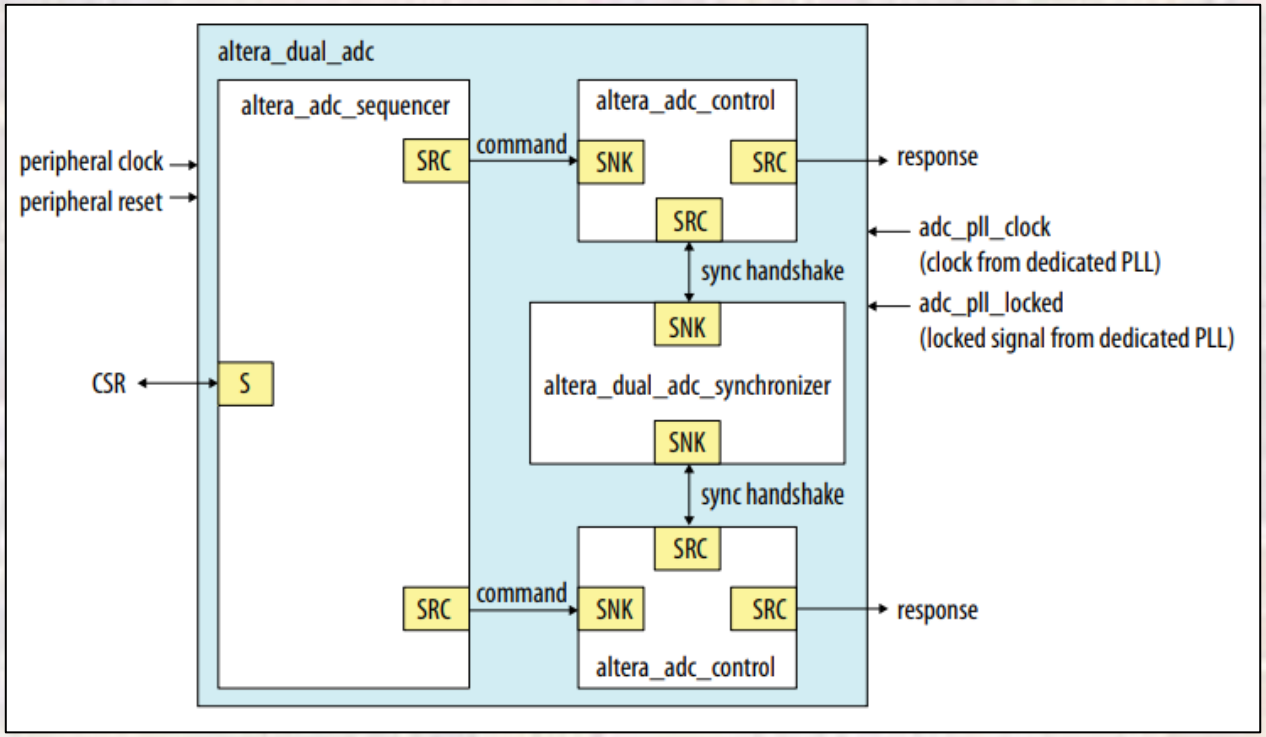
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with External Sample Storage
    - Sequencer manages multiple input pins and sequencing of samples
    - Control – controls the process
    - Managed by processor
    - Samples are stored outside the IP core



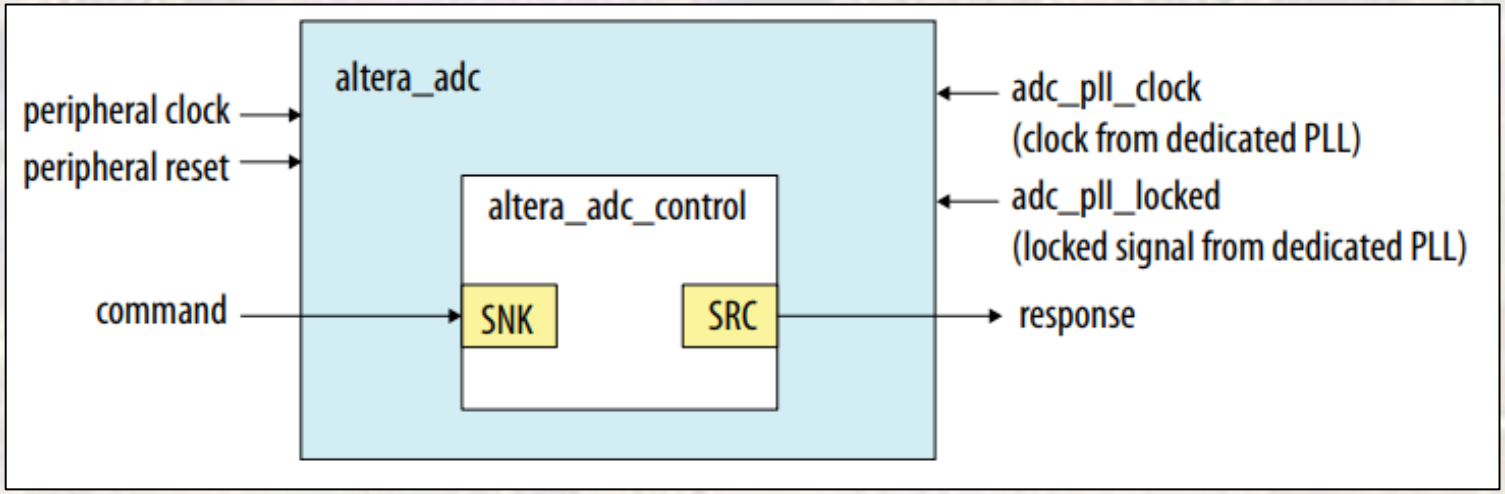
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - Standard Sequencer with External Sample Storage – Dual Core



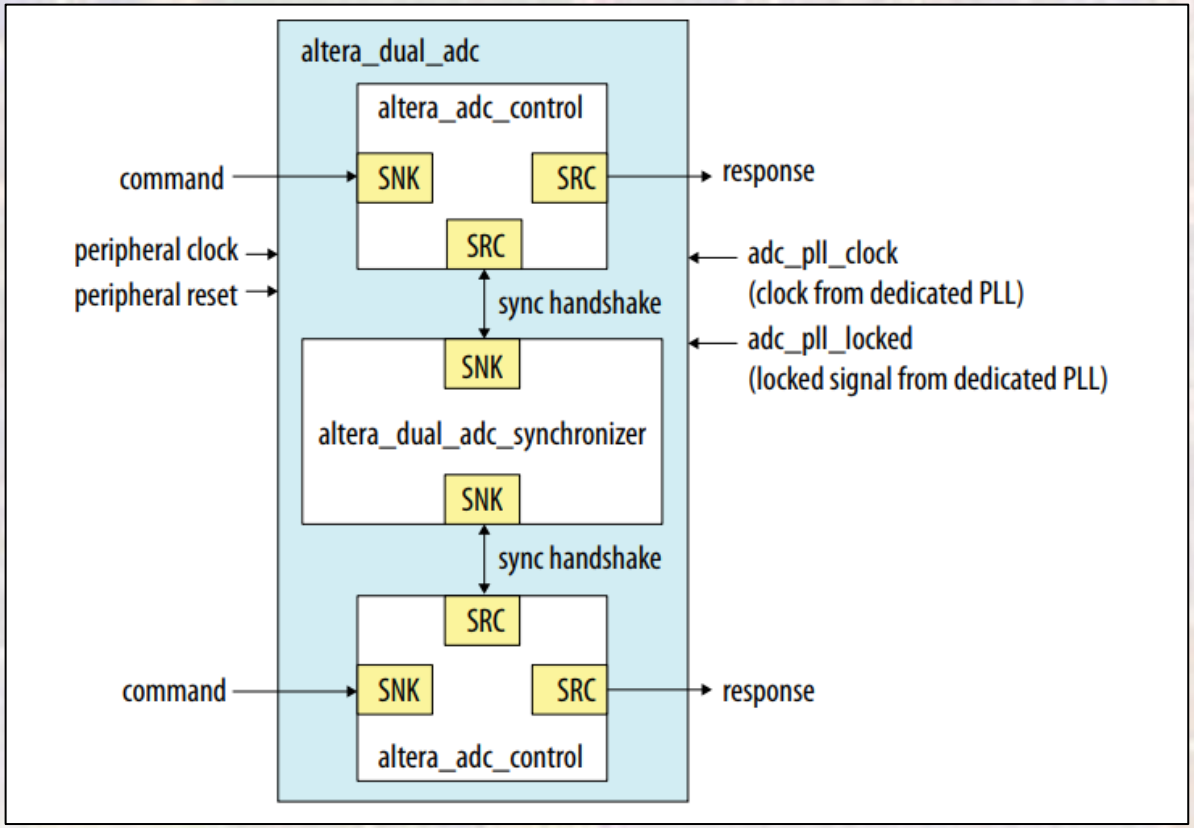
Max10 ADC

- ADC Configuration
  - 4 Configurations for each core
  - ADC Control Core Only
    - Control – controls the process
    - Managed by processor
    - No Sequencer
    - Samples are stored outside the IP core



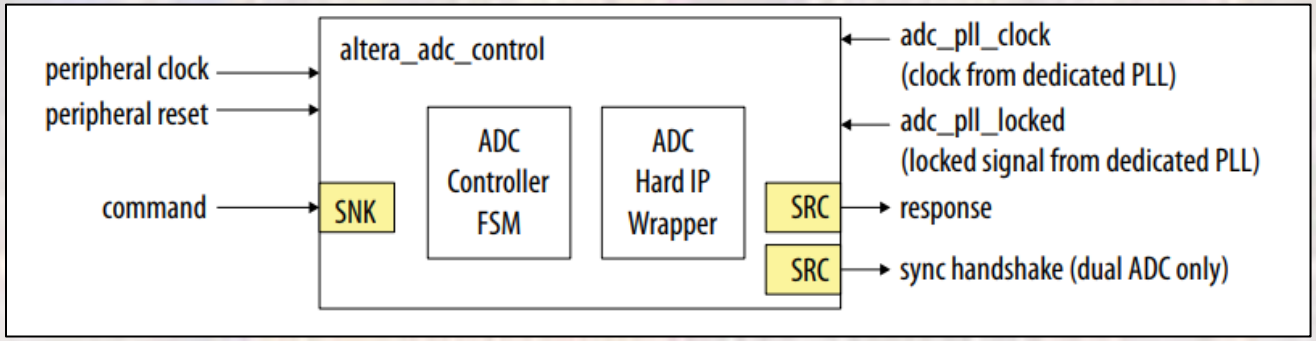
Max10 ADC

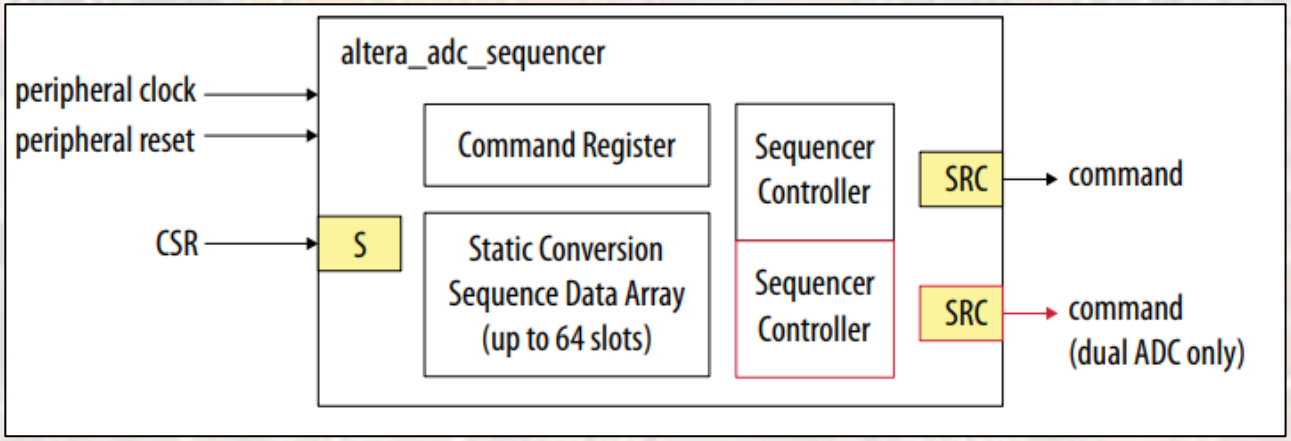
- ADC Configuration
  - 4 Configurations for each core
  - ADC Control Core Only – Dual Core



Max10 ADC

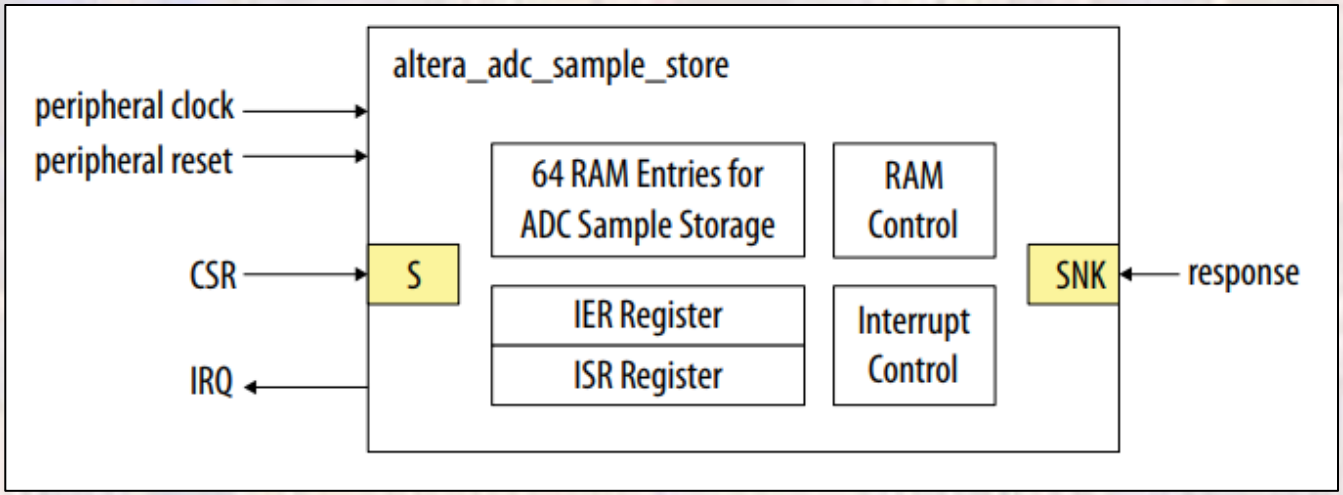
- ADC Configuration
  - Configuration Blocks





Max10 ADC

- ADC Configuration
  - Configuration Blocks



Max10 ADC

- ADC Configuration
  - 3 approaches to using the ADCs
    - Used as part of a NIOS system
      - Avalon interface built in by Platform Designer
    - Used with a hand built interface
      - Emulate the Avalon interface
    - Used with the Quartus ToolKit (Inside System Console) to verify operation
      - Avalon interface built into the toolkit

Max10 ADC

- DE10-Lite – ADC WARNINGS
  - Only ADC1 is brought out to pins
    - No access to ADC2 at the FPGA pins
    - ADC2 can be connected to internal signals
  - The pin #s are shifted
    - Arduino A0 is mapped to ADC1_in1

      …
    - Arduino A5 is mapped to ADC1_in6
  - No other ADC inputs are pinned out