Digital Audio Processor

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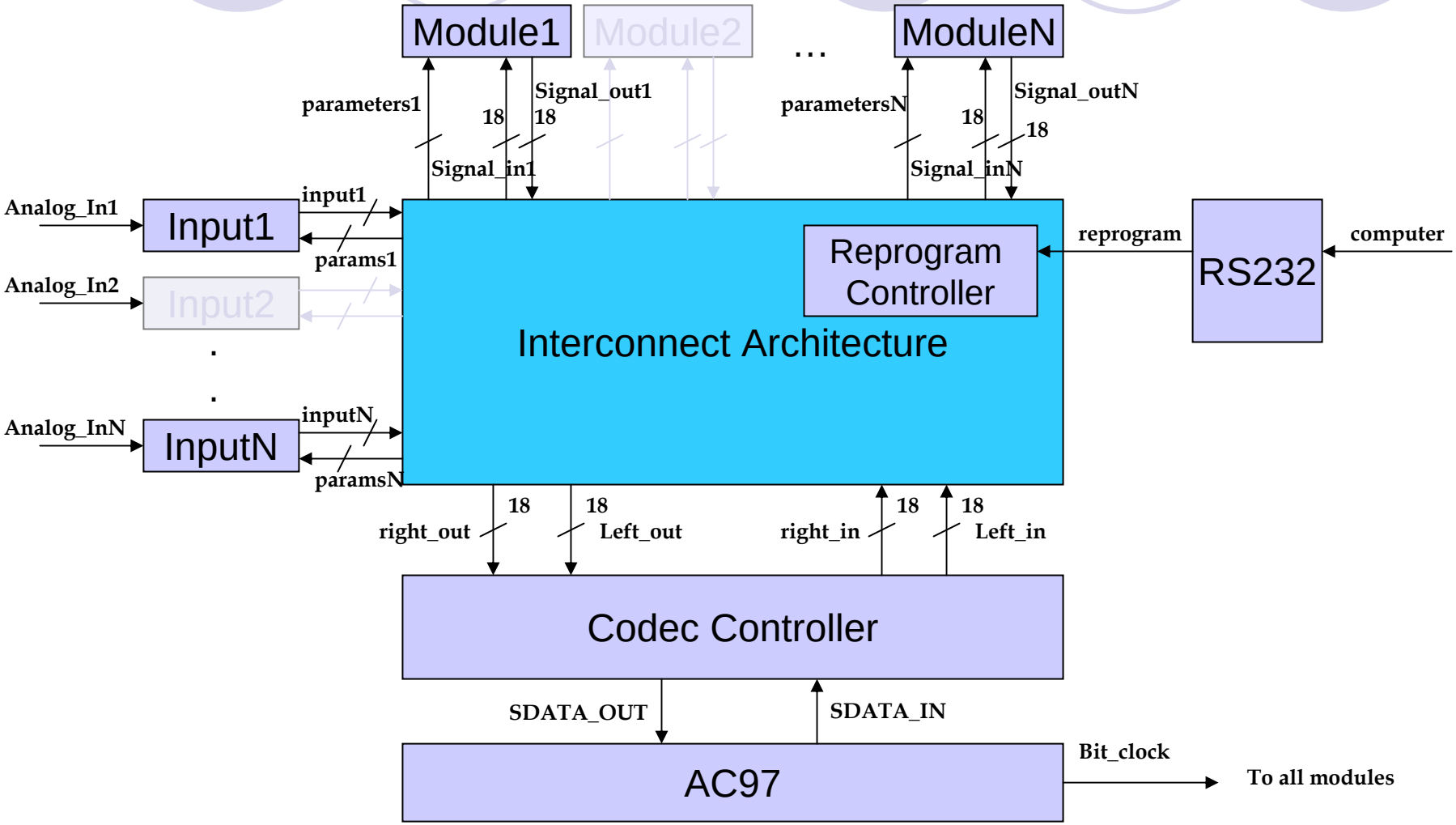
Project Overview

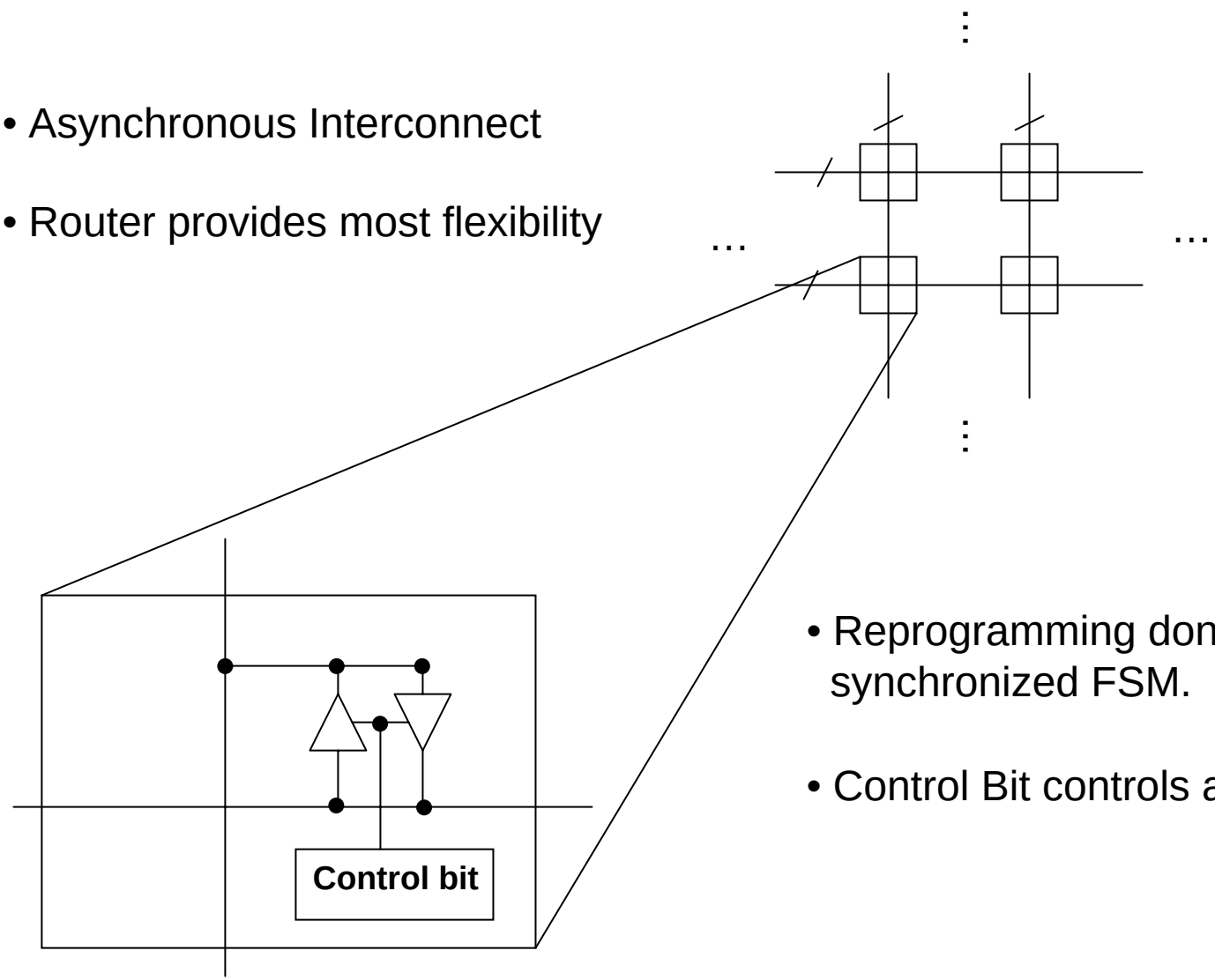
- Highly customizable digital audio system
- Provide pre-built effects packages with user-specifiable parameters
- Use audio “building blocks” with the packages to create unique effects
- Use a computer to configure the processor

Overall Block Diagram



Interconnect Architecture

- Asynchronous Interconnect
- Router provides most flexibility



- Reprogramming done by synchronized FSM.
- Control Bit controls a tristate buffer

Modules

Module Name	Parameters
Delay	Duration, Level, Feedback
Band Pass	Central Frequency, Width
Compressor	Threshold, Ratio, Attack time, Release Time
Expander	Threshold, Ratio, Attack time, Release Time
Mixer	-
Multiplier	Co-efficient

…….More?

Theoretical Implementation of Filters Signal Processing

Digital filters implementation:

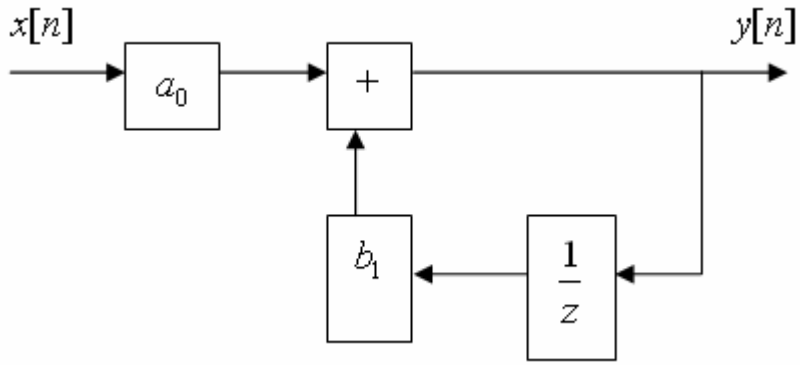
- IIR (Infinite Impulse Response)
- FIR (Finite Impulse Response)

Design Path of an IIR filter:

- Bode plot
- Transfer Function
- Impulse Response
- Z-transform
- Difference equation
- Verilog implementation using modular blocks

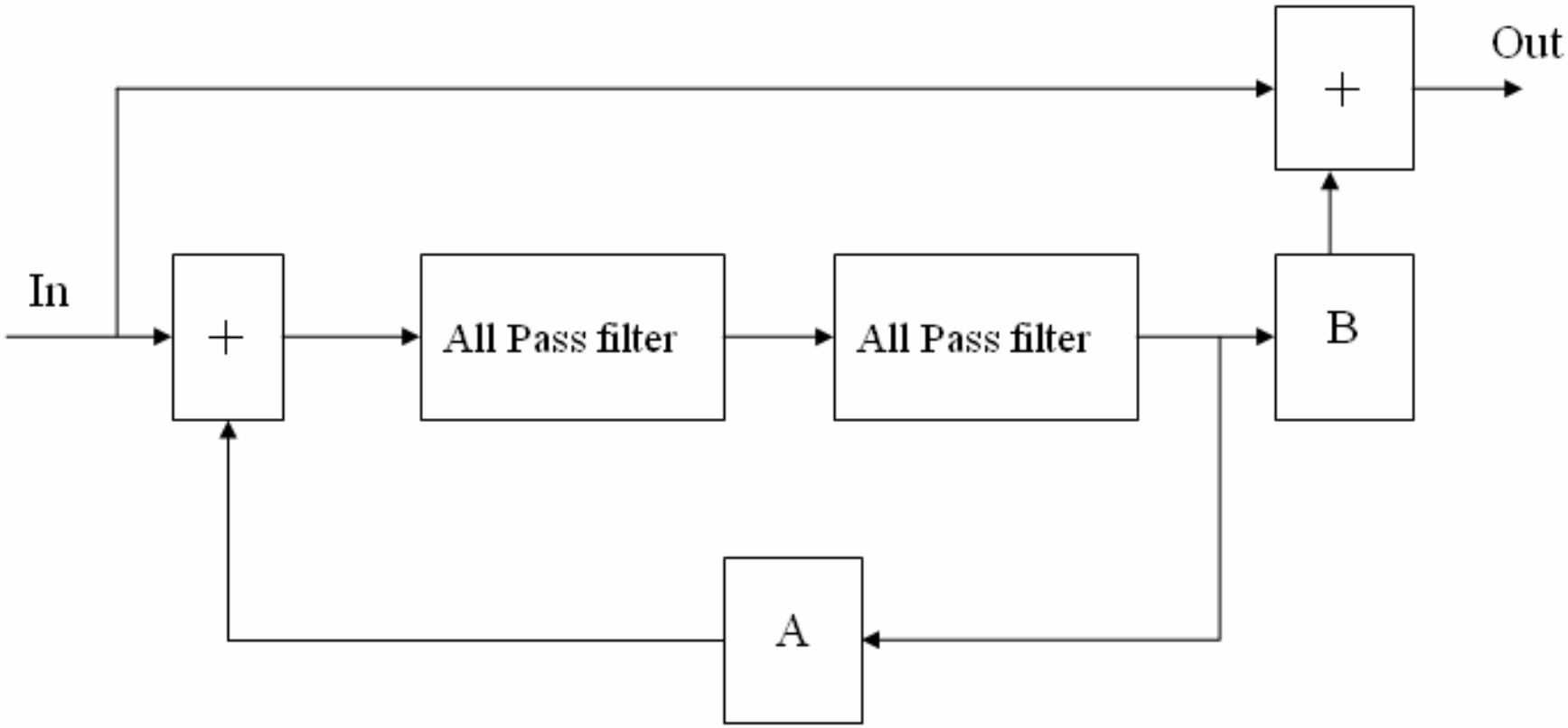
Implementation of a single pole Low Pass Filter

- Transfer function: $H(s) = \frac{1}{1+\tau s}$
- Difference equation: $y[n] = a_0 x[n] + b_1 y[n-1]$
- Implementation diagram:

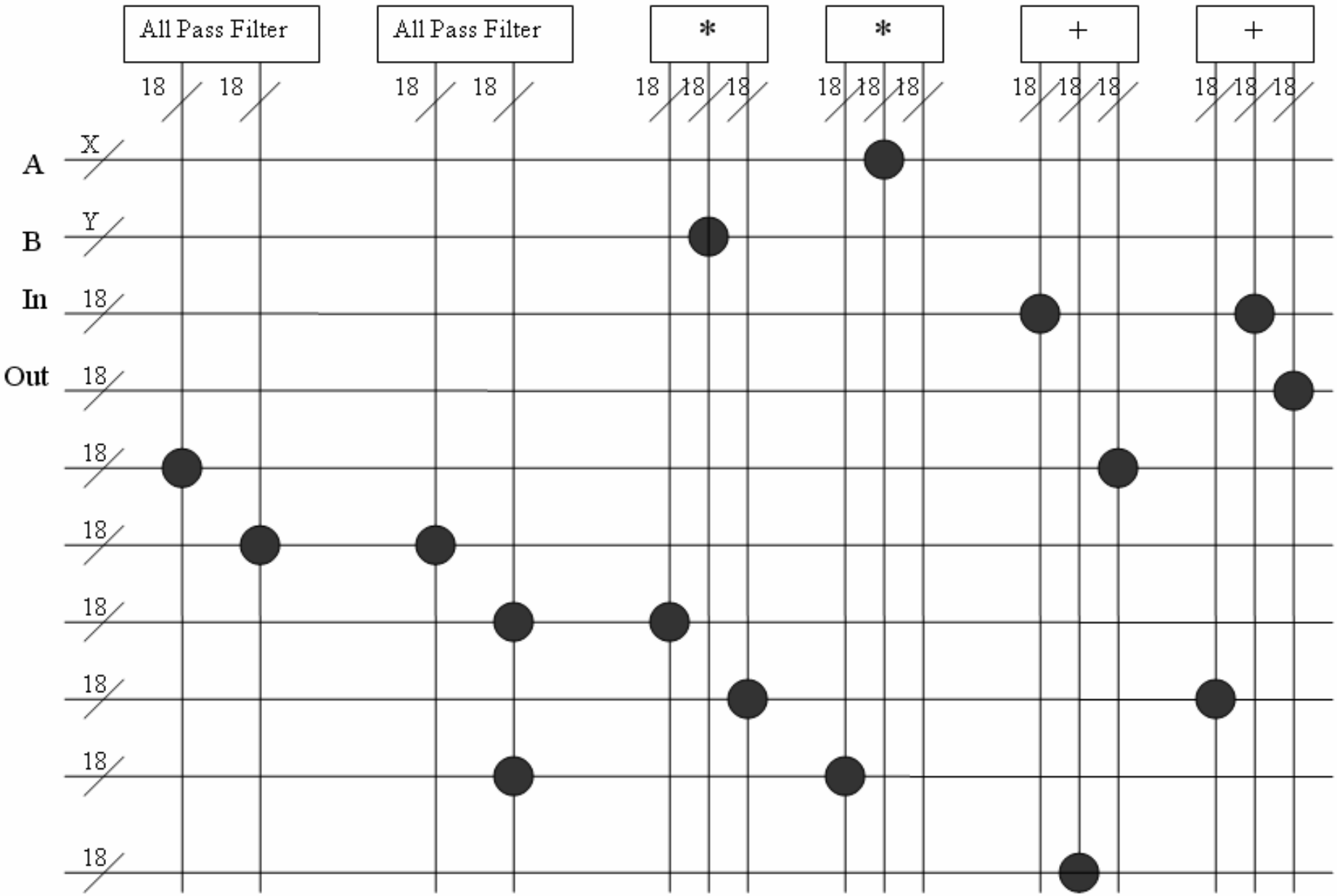


- Other filters, such as:
  - High Pass
  - Band Pass
  - Band Reject
- Can be easily implemented using this building block

Design of a Simple Phaser



Routing of a Simple Phaser Filter



Questions?