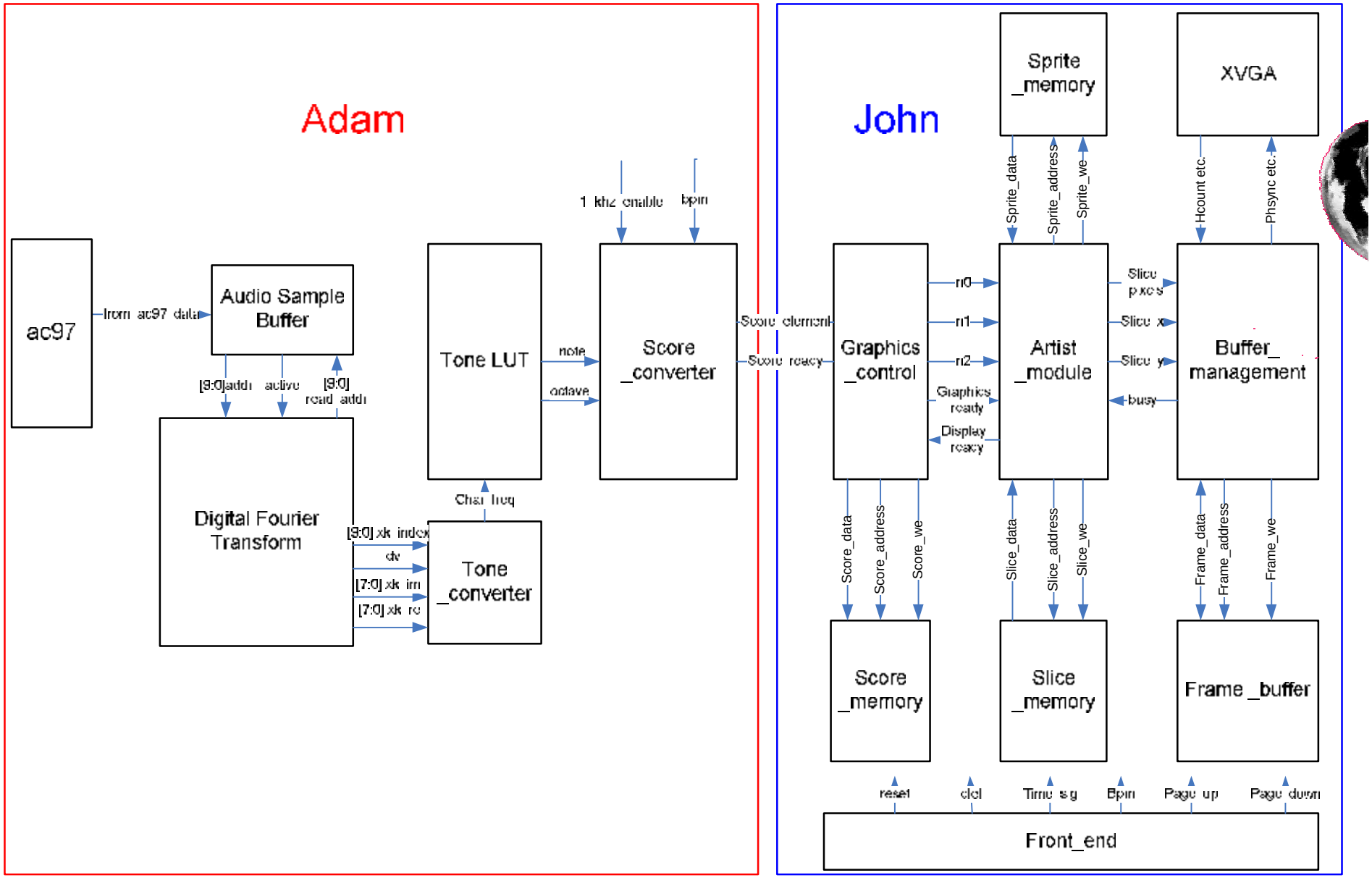
Perfect Pitch Sheet Music Maker

Goal: Real-time conversion of monophonic music, input via microphone, into conventional sheet-music format

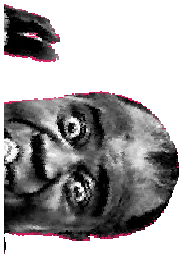
- **Input: Audio, user-defined clef/tempo/time signature**
- **Output: Multipage XVGA Display of sheet music**

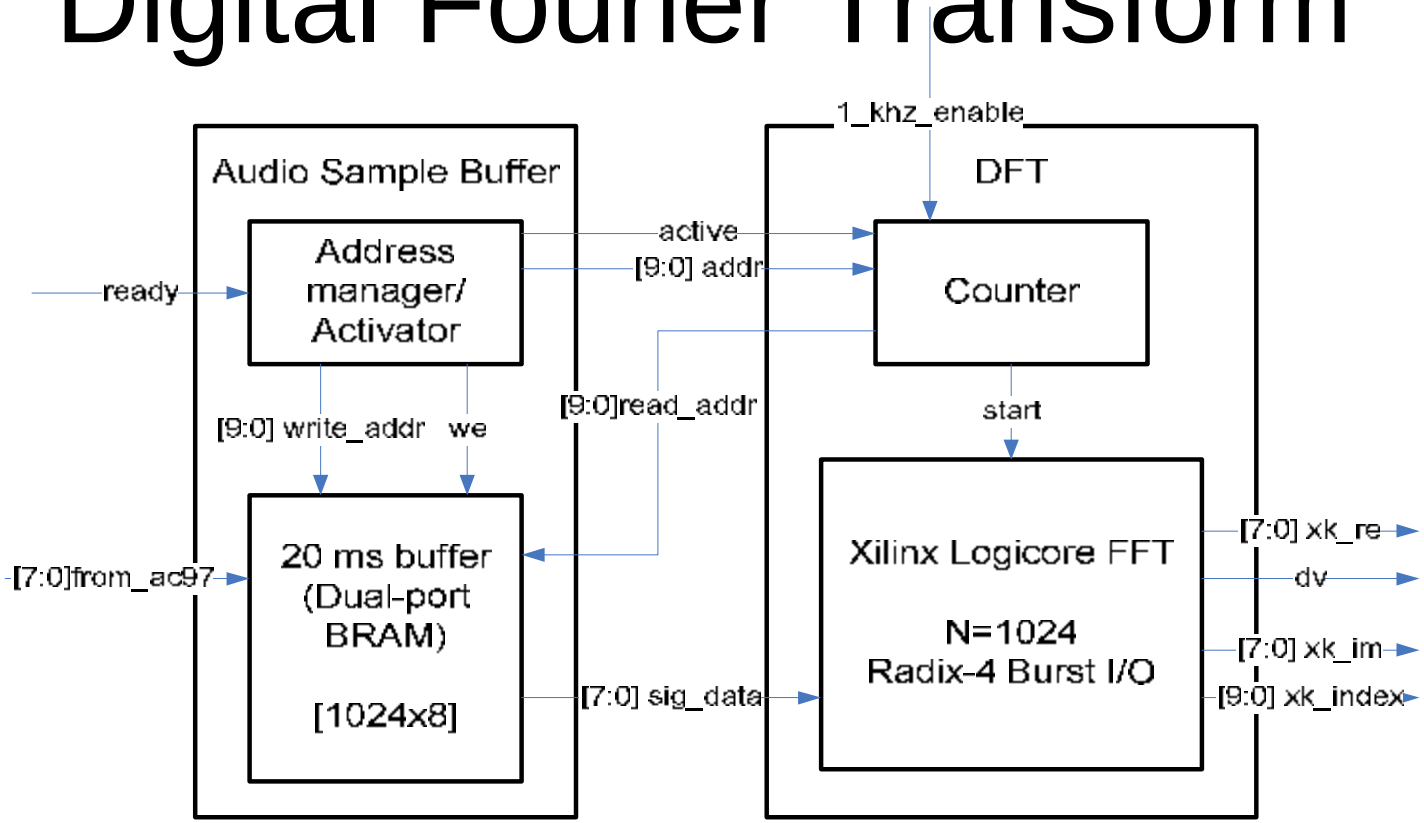
- **Features:**
  - **Transcribe any solo performance**
  - **Onboard metronome**
  - **Intelligently displays music in traditional sheet-music format**
  - **Can be used with a wide range of monophonic instruments**

Block Diagram



Digital Fourier Transform

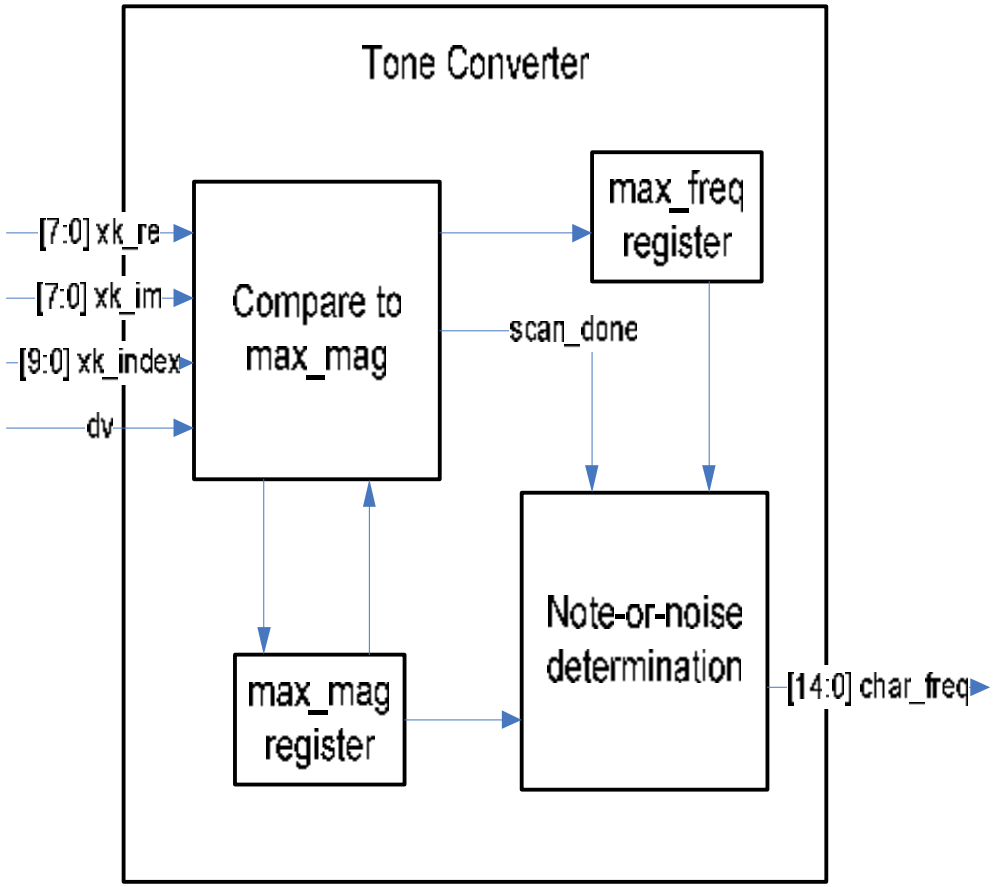




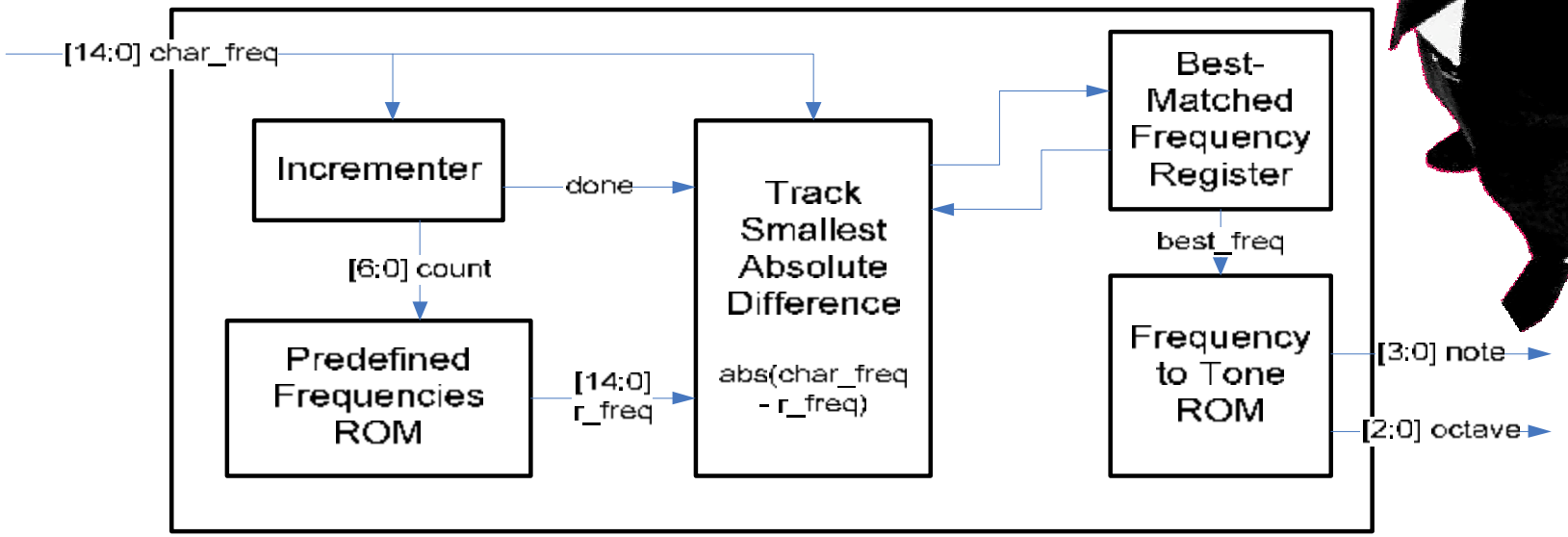
- 1024-sample BRAM fills up initially then rewrites over itself as new samples come according to Address manager/Activator (port 1)
- Counter alerts the FFT to incoming data, and supplies the read_addr necessary to retrieve the audio data (port 2)
- Counter cycles through all 1024 locations of the BRAM

Tone Conversion

- Finds point of greatest magnitude in FFT signal
- Takes index of greatest magnitude and calculates its frequency
- Looks at greatest magnitude and decides whether it is loud enough to be a note

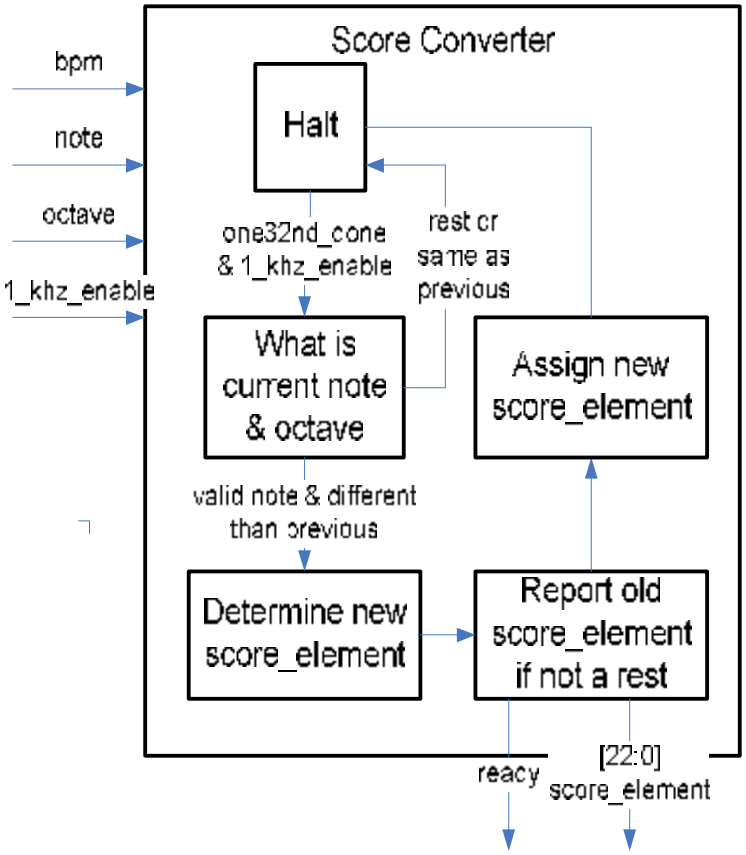


Tone LUT



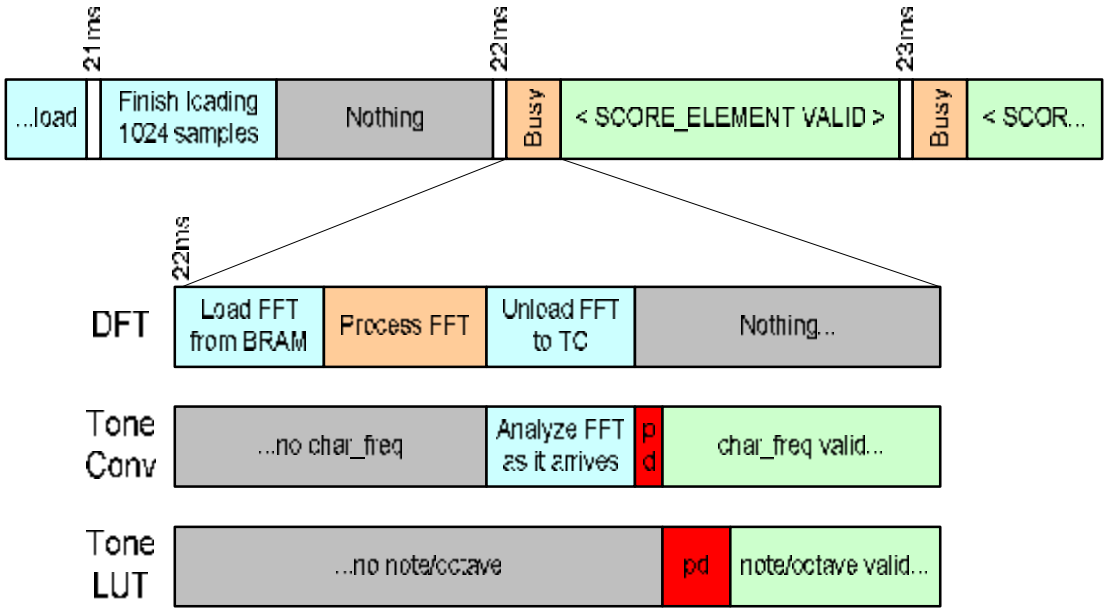
- On the change of char_freq, Incrementer cycles through all predefined frequencies of notes
- TSAD examines the difference between r_freq and char_freq, finds the best-matched (smallest difference) predefined frequency and loads it into the register
- The Frequency to Tone ROM outputs the corresponding note & octave to the score converter module

Score Converter Function



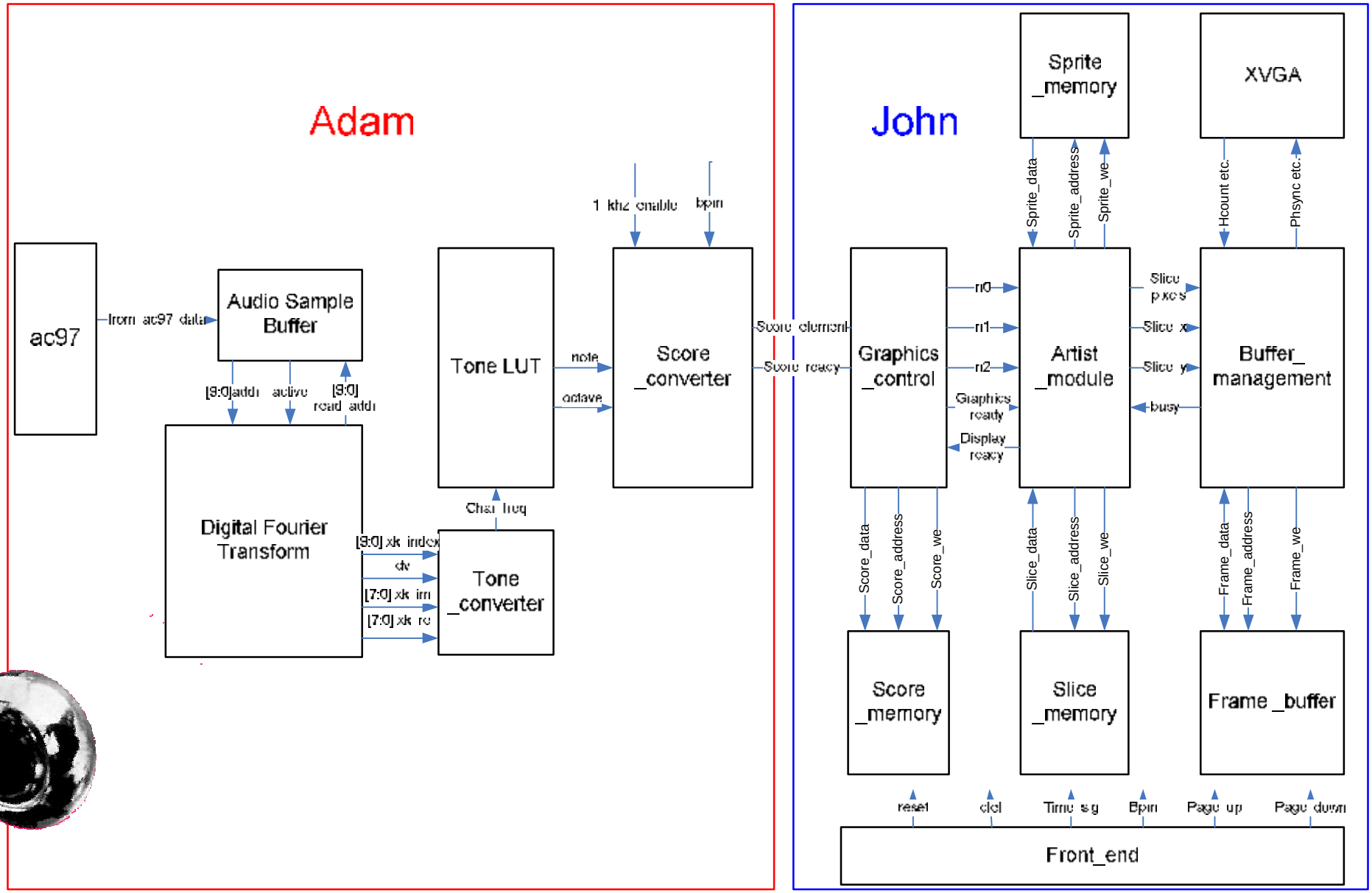
composition of score_element

[22:19] note	[18:16] octave	[15:12] duration	[11:0] startbeat

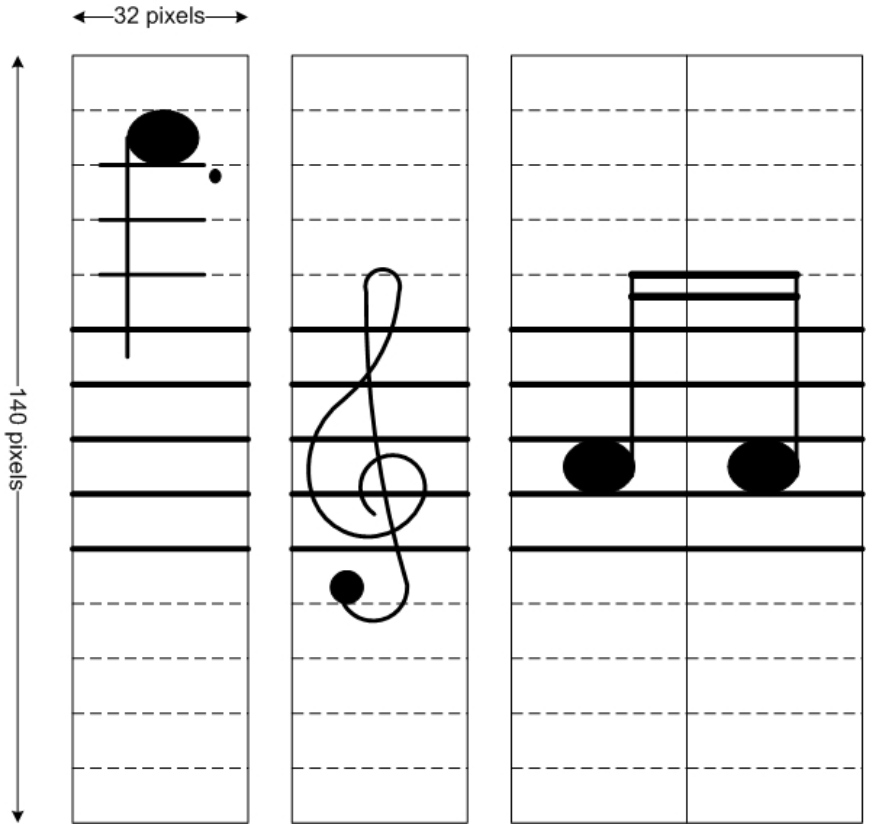


- Has enormous free time with which to analyze FFT (1ms)
- Records exactly as played, down to the 1/32nd
- Waits until the millisecond marker to report a completed score_element

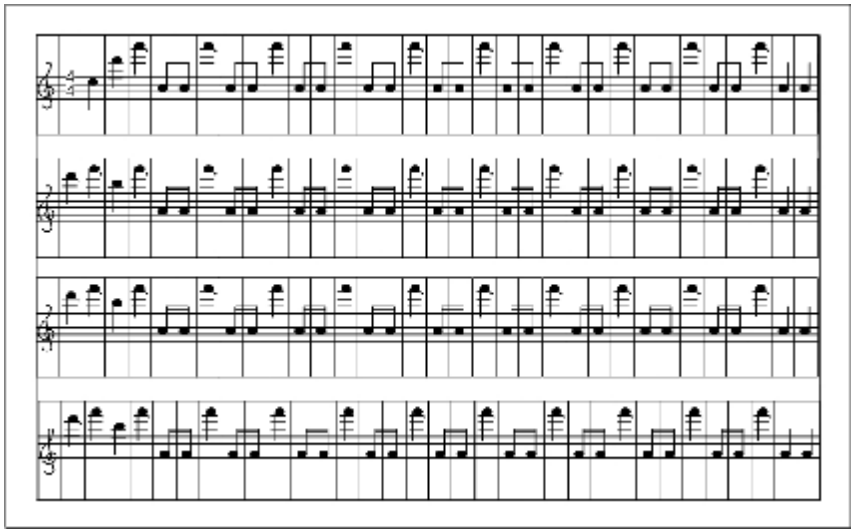
Block Diagram



Display



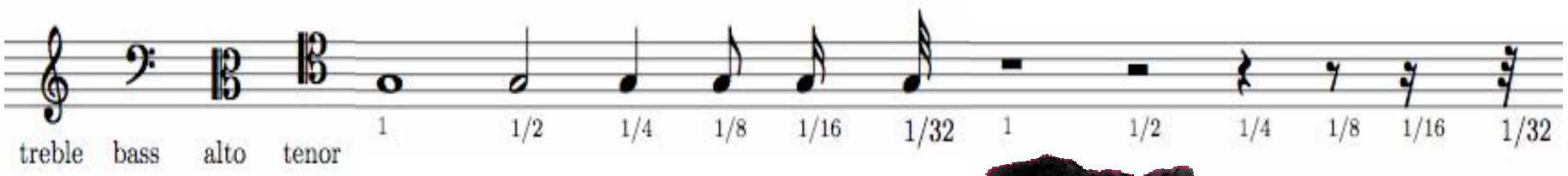
30 x 32 pixel wide slices



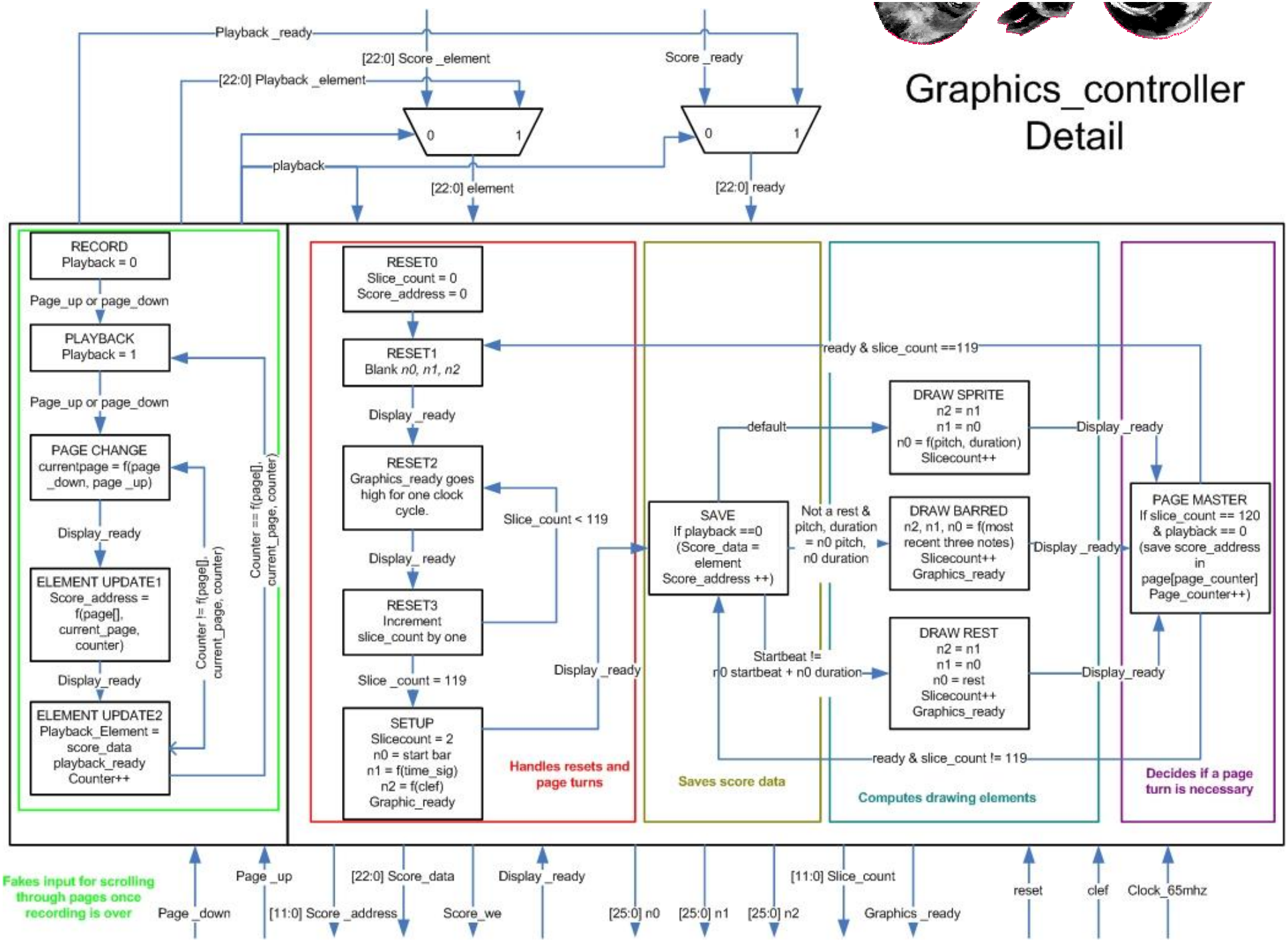
é Screen layout (1024x768 pixels)

ç Slice dimensions (32x140 pixels)

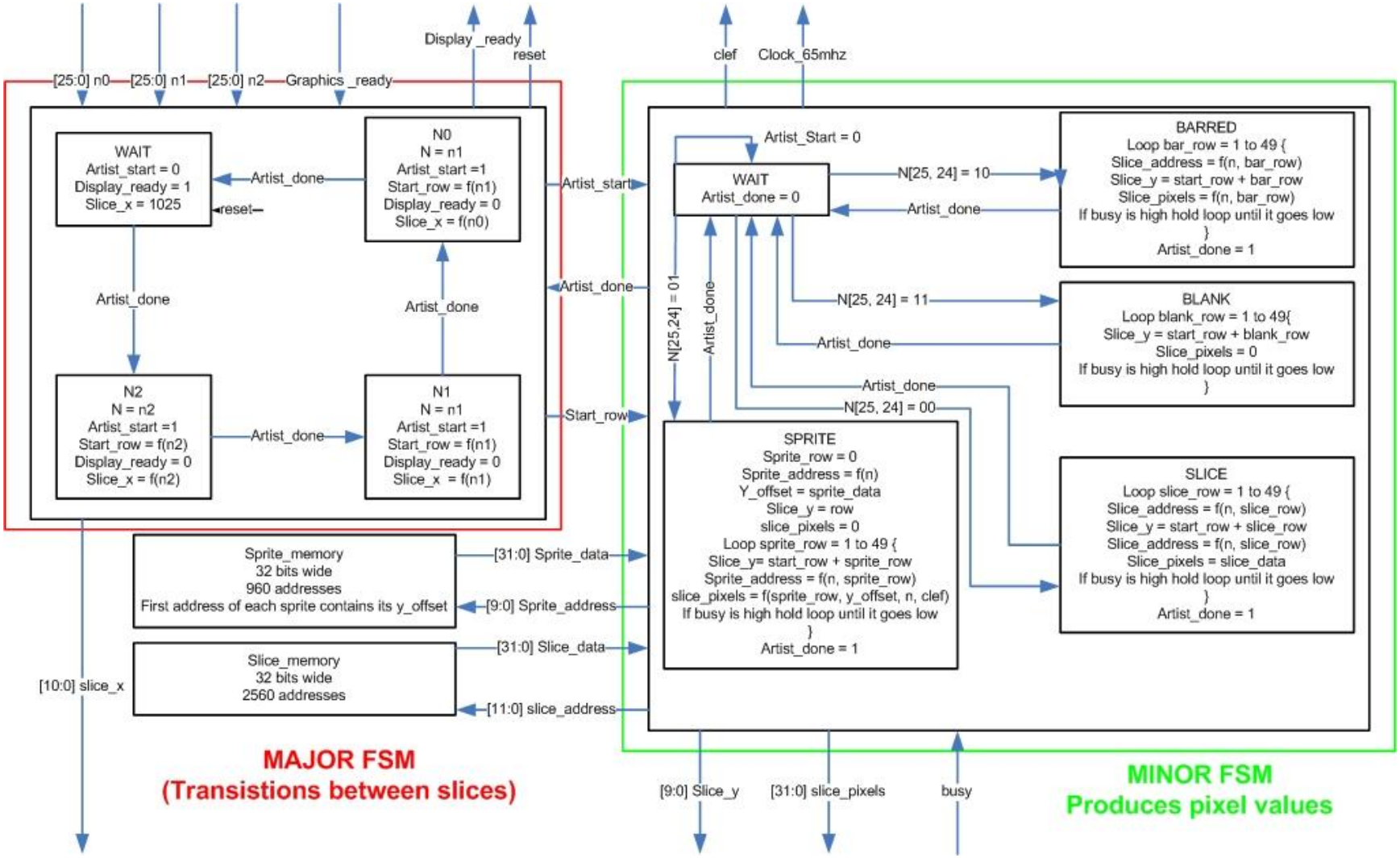
ê Some note sprites (32x50 pixels)



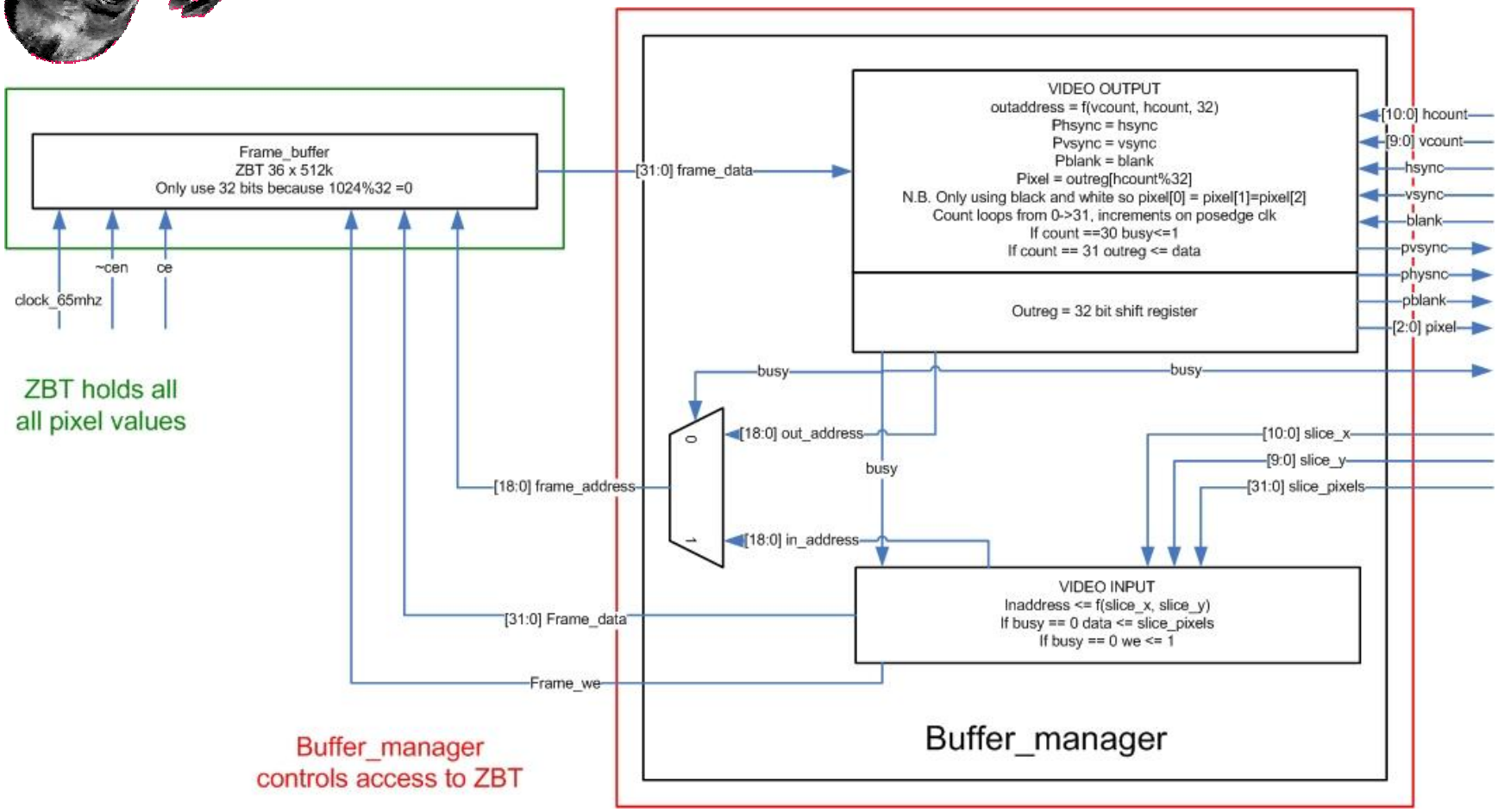
Graphics_controller Detail



Artist_module detail



Frame Buffer Detail



Optional Features/Expansions

- Additional methods of pitch-detection, to ensure accuracy in determining the note and octave
- Synthesized playback of recorded scores
- The option to input notes directly from a keyboard or midi cable
- A graphical mouse driven interface to replace the input switches
- The option to write a midi file containing the score to a flash memory card.