

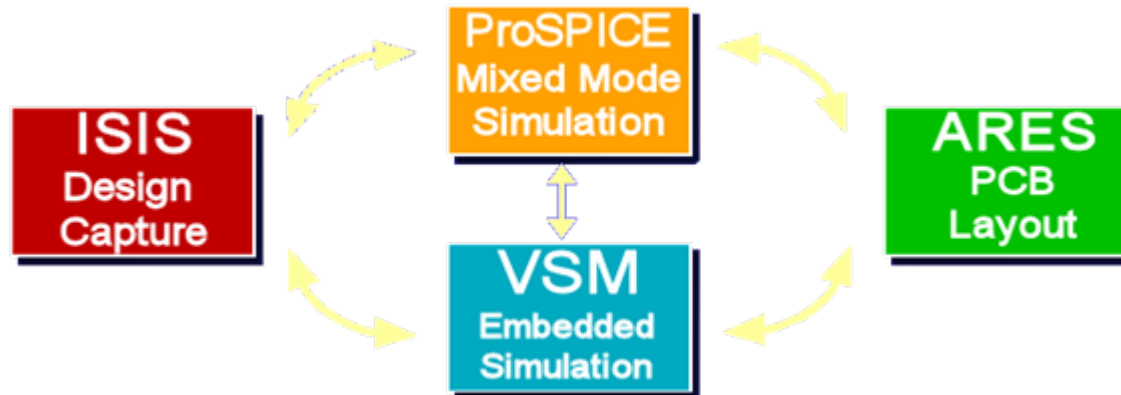
Proteus VSM

**Virtual PIC® Microcontroller
Prototyping with MPLAB®
IDE and Proteus VSM**

Proteus Overview

Proteus Overview

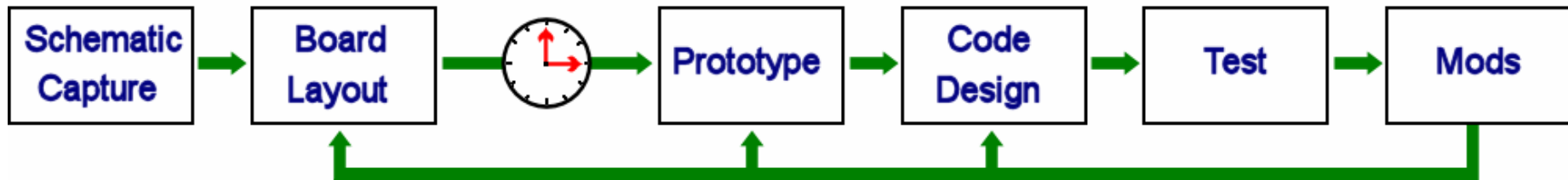
An introduction to the Proteus Design Suite.



- A traditional CAD package with extra functionality for embedded systems simulation
- Allows you to simulate your PIC[®] MCU together with any analog or digital electronics connected to it
- Provides a complete software design flow for the embedded engineer

Classic Design Lifecycle

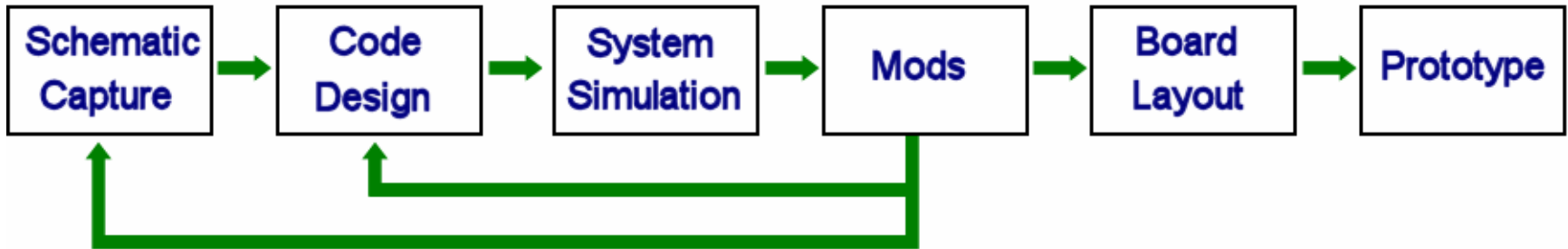
The critical design path in a typical project.



- Testing of the system cannot begin until a physical prototype is available
- Experimentation with code design is difficult without the system hardware
- Changes to system hardware are time consuming, particularly if a new prototype is required

Proteus Design Lifecycle

The critical design path with virtual simulation.



- The system is available for testing as soon as the schematic has been drawn
- Proteus facilitates simulation of software and its interaction with the entire system prior to prototyping
- Changes to hardware design can be made as easily as changes to software design



The Processor Models

A summary of the scope of PIC[®] MCU models available in Proteus VSM.

Well over 100 modeled PIC[®] MCU variants available:

- PIC10 / PIC12 Family:
 - 6 and 8 pin variants
- PIC16 Family:
 - 14, 18, 28 and 40 pin variants
- PIC18 Family:
 - 18, 28, 40, 64 and 80 pin variants
- PIC24 Family:
 - 64, 80 and 100 pin variants

The Processor Models

A summary of the functionality implemented in Proteus VSM CPU models.

- **PIC[®] MCU Model functionality:**
 - Entire instruction set including extended instruction set for appropriate variants
 - Supports all Port and other I/O pin operations
 - Supports all timers in all modes including
 - Watchdog
 - Sleep Mode
 - Wake-up
 - Supports (E)CCP modules in all modes
 - Supports Parallel Slave Port (on appropriate devices)
 - Supports MSSP module including
 - SPI (all modes)
 - I²C[™] (master and slave modes)

The Processor Models

A summary of the functionality implemented in Proteus VSM CPU models.

- **PIC® MCU Model functionality (continued):**
 - (E)USART in all modes
 - ADC Module including voltage reference pins
 - Analog Comparator Module with Internal or external reference
 - Internal Code and Data EE memory including data persistence and code protection
 - ALL Interrupt modes including priority on appropriate devices
 - I/O and other event timing accurate to one instruction cycle
 - Provides consistency checks on system operation
 - Writing to LCD Display while busy
 - Timing violation and contentions etc.
 - Extensively Tested with a suite of over 450 conformance analyses

The Peripheral Models

A summary of just some of the peripheral models included with Proteus VSM.

● Proteus VSM Peripheral Models:

- Thousands of standard 'building blocks' – TTL/CMOS, passives, etc.
- Interactive models for switches, buttons, pots, keypads etc.
- OptoElectronic models
- Motor models and controllers
- Memory models
- Temperature Control models
- Real Time Clocks and Timekeeping models
- I²C™/SPI Protocol models
- 1-Wire Protocol models
- RS232/RS485/RS422 Protocol models
- ADC/DAC Converter models
- Pulse Width Control models
- Power Management models
- Many, many others!

Measurement and Analysis



Analysis Techniques

Introductory discussion of analysis techniques with Proteus.

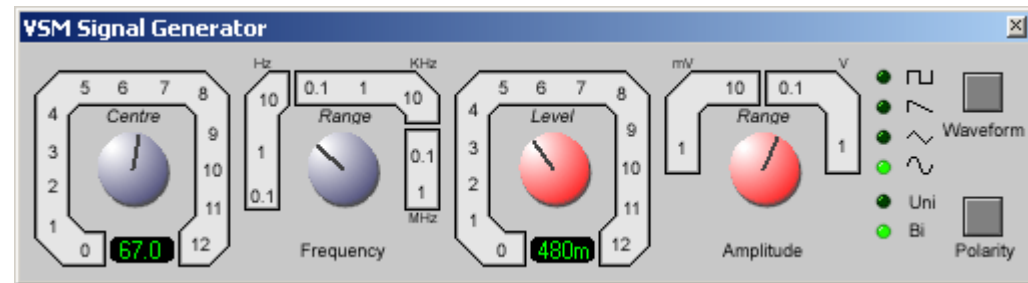
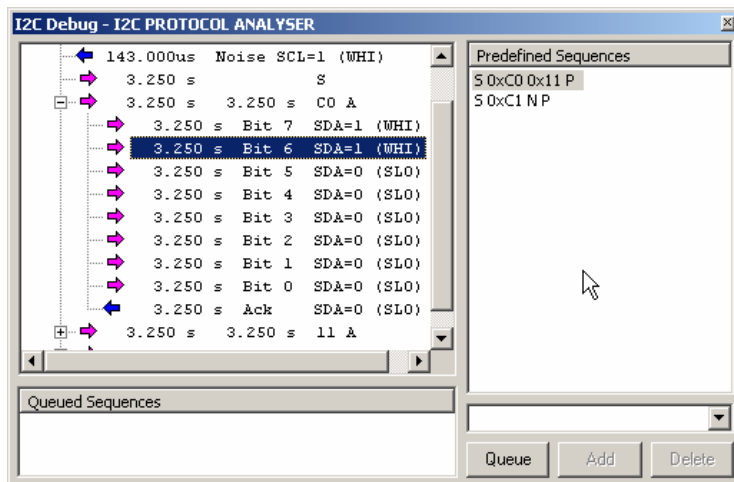
- Two main methods for analyzing data in Proteus
 - Interactive Analysis – View data while simulation is in progress
 - Graph Based Analysis – Graph data and examine after simulation is complete

Analysis Techniques

Introductory discussion of Interactive analysis with Proteus.

● Interactive Analysis:

- Use Virtual Instruments to monitor data changes as you inject simulation stimuli
- Protocol Analysers provide packet decoding and analysis for I²C™/SPI comms.
- Live capture allows for instant interrogation of data streams/waveforms



Virtual Instrumentation

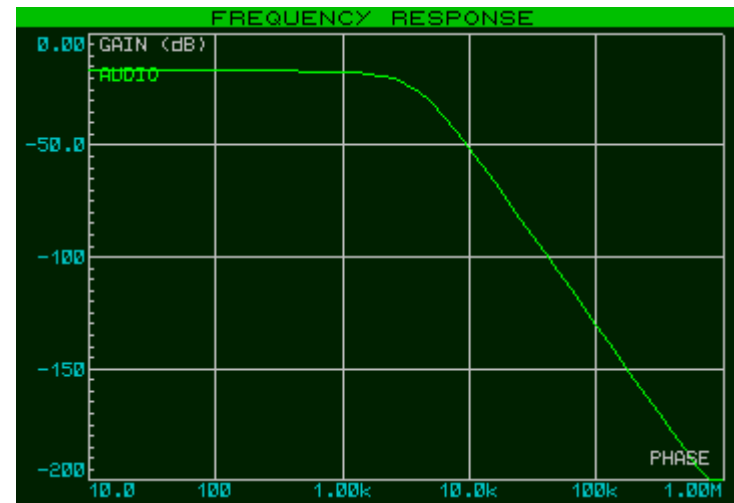
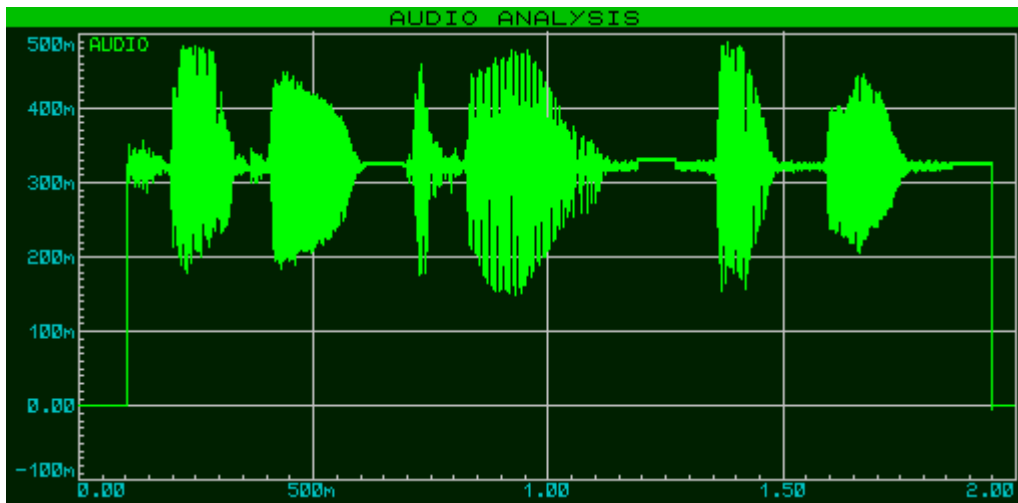
A summary of instrumentation included with Proteus VSM.

- Proteus VSM Virtual Instruments:
 - Oscilloscope
 - Logic Analyser
 - Analog Signal Generator
 - Digital Pattern Generator
 - Counter/Timer/Frequency Meter
 - TTY/RS232 Terminal
 - Dual Mode I²C™/SPI Protocol Analyzers
 - Simple Voltmeters and Ammeters
 - Logic Level Display on Pins

Analysis Techniques

Introductory discussion of Graph based analysis with Proteus.

- Graph Based Analysis:
 - High Granularity analysis for accurate measurement and detailed results
 - A comprehensive toolsuite for advanced analysis
 - Includes a unique quality assurance mechanism for baselining projects



Debugging and Diagnostics

Debugging Designs

An introduction to debugging with Proteus and MPLAB® IDE.

- MPLAB® IDE Based Debugging Tools:
 - High Level / Low Level Single Step
 - System Level Synchronised Debugging
 - Breakpoints
 - Watch Windows
 - Conditional Breakpoints
 - Value Injection
- Schematic Based Debugging Tools:
 - Logic Indicators on Pins
 - Hardware Breakpoints
 - Interrogation of external system peripherals
 - Real Time Voltage/Current Probes
 - Virtual Instrumentation

Conclusions

A summary of debugging and diagnostics.

- MPLAB® IDE provides powerful debugging tools to identify faults in software design
- Proteus adds to this by allowing you to debug on hardware conditions
- Diagnostic tools allow to you to ‘look inside’ components and monitor program flow through selected peripherals
- The integrated solution provides a debugging environment where the entire embedded system is synchronized under your control
- Both hardware design and software design can therefore be tested and debugged within the one environment