Trends in Prototyping Systems

A Complete Design Platform

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Agenda

- Focus of design dept.
- Electronic system & Flow
- Design problems
- Educating design
- Prototype
- USDP
- Features
- Applications
- Conclusion
Focus of Design Dept.

- Faster Solutions
- Higher Integration
- More Features
- Compact form factor
- TTM
Electronic System

A system can be defined as “A group of independent but inter related elements comprising a unified whole”.

Or “A processing platform, where all element work together for a goal, with the given instructions.”
Electronic System

Communication Interface
Serial, parallel, high speed, USB, irDA, PCI

Digital Logic
FPGAs/CPLDs

Master
Microprocessor/Microcontroller

Memory
SRAM, FLASH, DRAM

Analog Circuitry
Sensors, Buffers, amplifiers, ADC, DAC

Display
LCDs, LEDs

Power Electronics
SCRs, optical isolators, relays, IGBT
Electronic System

- Microprocessor/Microcontroller (8051, RISC, PIC, ARM)
  - A traditional approach
  - Small form factor available
  - Ease of design
  - A real manager

- Digital Logic (FPGA, CPLD)
  - HUGE complex logic in one device
  - Small form factor
  - Higher frequencies
  - Flexible & reprogrammable
Electronic System

- Communication Interface (USB, RS232, irDA, PCI)
  - Depends on data size and speed.
- Memory (FLASH, SRAM, DRAM)
  - For what reasons to store data
  - Look up tables
  - Log files
  - Access time
- Analog Circuitry (ADC, DAC, buffers, SCU, filters)
  - Real world communicator
  - Level translations
  - Sensors
Electronic System

- Power Electronics (IGBT, SCR, relay)
  - High V & I to handle
  - Motor control
  - Electromechanical design

Selection of devices and interfaces depends
- Application
- Handling
- Environment
- End user needs
Design Flow

1. Specs and requirement
2. Schematic
3. Source Codes (ASM, C)
4. Digital Logic (HDLs)
5. Prototype schematic
6. Testing

PCB

1. Testing
2. Bug removal and fixes
3. PCB (2nd)
4. Testing
5. Product Deployment
Design problems

Designing an circuit or part of application is easy than the integrating all circuits to make a system.

Problem Focus
- Schematic prototyping
- Integration of modules at test level
- Ease of integrating various modules
- Testing of prototypes
- Code debugging
- Flexibility in prototype hardware

Boss is always for TTM
Educating design

- College Laboratories
  - Microprocessor, Microcontroller, VLSI, Instrumentation, EDC, electrical, communication, Project.
- Fresher is known to modular designs (with hiccups)
- Need for sophisticated equipments and kits for training
- More focus on system design
- Intensive labs on application design & development
- Deadline attitude
- Research platform
- Industry connection
Prototype

“A system model to test and develop the product before its final implementation.”

- Prototyping is like headache to designers
- Ease of prototyping is necessity
- Flexibility is must
- Individual eval boards or kits available

- Need for universal platform integration
- Modular approach
- Up gradation and addition of modules at regular interval.
USDP
Universal System Development Platform

- A universal platform for various technologies
- An excellent prototyping and system development platform
- Modular approach
- Modules can be integrated according to needs
- Flexible and easy up gradation
USDP
Universal System Development Platform

One Platform

Prog. Port
FPGA
FPGA

Keypad Interface
Box Osc.
Configurable I/Os
7 – Seg Disp, LCD interface

Modules
Features

- Backplane features
- Supports interface with dual daughter PLD cards
- Supports FPGAs from reputed PLD vendors like Xilinx, Altera, etc.
- 3 PCI connector based application specific add-on cards
- 64 bit bus sharing between application add-on cards and PLD daughter cards
- 32 Digital I/Ps and O/Ps
- On board system reset circuit.
- Four seven segment Multiplexed display.
- 4x4 switch matrix keyboard interface header.
- On board crystal oscillator socket (user can select his desired oscillators).
- High performance backplane PCB (upto 80MHz board designs).
Features

- **Xilinx FPGA Card**
  - Supports Spartan-II device family of FPGA's.
  - User selectable configuration modes
  - Onboard PROM support.
  - Support for different I/O Standards
  - High speed interface with other add-on cards
  - A complete I/O bank for user VREF interface, using DB25 connector

- **Altera FPGA Card**
  - Supports ACEX 1K device family of FPGA's.
  - User selectable configuration modes.
  - Onboard PROM support.
  - High-speed interface with other add-on cards.
  - Parallel port interface directly from add-on card of FPGA
Features

- **Micro-controller Card**
  - Philips 89C51 RD2 controller (ISP).
  - RS-232 interface.
  - On board serial EEPROM.
  - On board serial RTC.

- **PIC Micro-controller Card**
  - Microchip 16F877 PIC microcontroller (ISP).
  - In built ADC, PWM, timers, etc.
  - On board RTC and RS 232 Interface.
  - Interrupt port.

- **Memory Add-On Card**
  - 512KB x 4 SRAMs, total 2MB capacity.
  - Direct interface with FPGA module.
  - 70ns of access time.

All ports accessible through edge connector.
Features

- **ADC/DAC Add-On card**
  - 4-channel ADC.
  - 2-channel DAC.
  - Sampling rate upto 400 KSPS.
  - 8-bit ADC resolution.
  - 12-bit DAC resolution.
  - 0-5V or +/- 2.5V input voltage.

- **General Purpose Add-On Card**
  - General-purpose layouts.
  - Helps in prototyping electronic circuits
  - To interface custom circuits with modules
  - Useful in mixed signals designs.
Features

- **Power Electronics module**
  - IGBT based O/P drive, with current rating upto 60 Amps.
  - Dual high current relays.
  - Stepper motor controller circuit.
  - 5 optically isolated O/Ps.
  - Step down transformer (/100) for line monitoring applications.
  - High current capacity connectors (10Amps)

- **Other Accessories Provided**
  - SMPS
  - 4x4 membrane keypad with cable.
  - 16x2 character LCD with cable.
Applications

- System prototyping and testing
- Prototyping of FPGA designs
- Research and development of high-speed FPGA designs.
- Design and development of FPGA based DSP designs and algorithms
- Understanding of various FPGA architectures
- Performing a wide range of experiments, by actually downloading the designs into FPGA
- Understanding the basics of HDL’s and digital logic interface
- Robotics and Motion control applications.
- Microcontroller based applications.
- PC controlled design development.
- Many more………..
Conclusion

With the use of USDP designers are free from basic development problems and enjoys following:

- Easy system design and development.
- Good learning and design implementation platform.
- Single platform for multiple technologies.
- Stacking of multiple FPGAs which makes multiple FPGA designs development possible.
- Higher performance.
- Add-on modules for all type of applications.
- Capable for future advancement and up gradation with new technologies.
- Large number of user interface.
Thank You

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