ADVANCED PROCESSOR ARCHITECTURES AND MEMORY ORGANISATION –
Lesson-19: PROCESSOR, MICROCONTROLLER SELECTION

1. PROCESSOR SELECTION

Chapter-2 L18: "Embedded Systems - " , Raj Kamal,
Publs.: McGraw-Hill Education

Processor

- Should operate at higher clock speed for processing more instructions per second.

- High computing performance of computing when there exist (a) Pipeline(s) and superscalar architectures, (b) pre-fetch cache unit, caches, and register-files and MMU and (c) RISC architecture.

- Register-windows provides fast context switching in a multitasking system.

Processor

- Power-efficient embedded system requires a processor that has auto-shut down feature for its units and programmability for the disabling these use of these when the processing need for a function or instruction set does not have constraint of execution time. It is also required to have Stop, Sleep and Wait instructions. It may also require special cache design.

Processor

- Burst mode accesses external memories fast, reads fast and writes fast.

- Atomic operation unit provides hardware solution to shared data problem when designing embedded software, else special programming skill and efforts are to be made when sharing the variables among the multiple tasks

Processor- specific features

- Big endian or little endian
- Energy efficient

2. Microcontroller Version Selection

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Numerous versions of 8051

- Additional devices and units are provided in different versions.

- A version selected for embedded system design as per the application as well as its cost.

Examples

- An embedded system in automobile for example requires CAN bus─ a version with CAN bus controller is selected.

- An 8051 enhancement 8052 ─ an additional timer.

- Philips P83C528 ─ I^{2}C serial bus

- 8051 family member 83C152JA (and its sister JB, JC and JD microcontrollers) haves two direct memory access (DMA) channels on-chip.

Example

- 80196KC has a PTS (Peripheral Transactions Server) that supports DMA functions

3. MEMORY SELECTION

ROM image file in memory

- Software designer coding is over and the ROM image file is ready, a hardware designer of a system is faced with the a questions, of what type of memory and what to use, how much size of each, should be to used.

Case Studies

- Automatic Washing machine

- Data Acquisition Systems for the sixteen-parameters channels

- Data Acquisition Systems for the ECG waveforms

- Multi channel Fast Encryption and cum decryption Transceiver System

- Mobile Phone system

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Summary

We learnt
- Processor selection
- Microcontroller selection
- Memory selection

End of Lesson 19 of Chapter 2