Unit -I

INTRODUCTION TOEMBEDDED SYSTEMS

1.1 1a.General purpose microprocessor

For example, Intel80x86, Space, or Motorola68HCxxx

1b.Embeddedgeneralpurposeprocessor

Fast context switching features, use of on-chip Compilers, for example, Intel® X Scale ™Applications Personal Internet Client Architecture-based PDAs, cell phones and other wireless devices,

2.   Application Specific Instruction-Set Processor (ASIP)

(a)   Microcontroller — Intel, Motorola, Hitachi, TI, Philips and ARM, for example, an Intel®MCS51,Philips®51XA, 51MX, or Motorola— 68HC11, 68HC12, 68HC16DSP or Typically a Texas Instruments- C28xSeries, C54xx or C64xx or Analog Device s SHARC or Tiger SHARC ,Motorola 5600xx

(b) MediaprocessorTIDSPTMS320DM310orTrimediaPhillipsMediaProcessor1x00series for Processing Streaming and Data Networks and Image, Video and Speech: PNX 1300,PNX1500(2002)

(c) IO processor or

(d)Network processor or

(e)A domain specific processor

3. GPP or ASIP core(s)

GPP or ASIP integrated into either an Application Specific Integrated Circuit (ASIC) ,or a *Very Large Scale Integrated Circuit*(VLSI) circuit or a FPGA core integrated with processor unit(s) in a VLSI(ASIC)chip

4. Application Specific System Processor(ASSP)

Typically a set top box processor or mpeg video-process or network application processor or mobile application processor

5. *Single purpose processor or Application Specific Instruction processor*

- Floating point Co processor
- CCD Pixel co processor and image codec in digital camera
- Graphic processor
- Speech processor
- Adaptive filtering processor Encryption engine
- Decryption engine
- Communication protocol stack processor
- Java accelerator

Examples Java Accelerator *Noncommunication's* Java codes run 15 to 60 Times fast,
Video Accelerator for fast Video Processing

6. *Multi core processors or multiprocessor system using GPPs*

Examples
- Multi processor system for Real time performance in a video-conference system,
- Embedded firewall cum router , High - end cell phone.

Hardware Elements in the Embedded Systems

(i) Power Source

1. System own supply with separate supply rails for IOs, clock, basic processor and memory and analog units
2. Supply from a system to which the embedded system interfaces, for example in a network card,
3. Charge pump concept used in a system of little power needs, for examples, in the mouse or contact-less smart card.

Power Dissipation Management

1. Clever real-time programming by Wait and Stop instructions
2. Clever reduction of the clock rate during specific set of instructions
3. Optimizing the codes and
4. Clever enabling and disabling of use of caches or cache blocks

(ii) Clock Oscillator Circuit and Clocking Units

1. Appropriate clock oscillator circuit
2. Real Time Clock(System Clock) and Timers driving hardware and software

(iii) Reset Circuit

1. Reset on Power-up

2. External and Internal Reset circuit

3. Reset on Timeout of Watch dog timer

(iv) Memory

a. Functions Assigned to the ROM or EPROM or Flash

1. Storing 'Application 'program from where the processor fetches the instruction codes

2. Storing codes for system booting, initializing, Initial input data and Strings.

3. Storing Codes for RTOS.

4. Storing Pointers (addresses) of various service routines.

b. Functions Assigned to the Internal , External and Buffer RAM

1. Storing the variables during program run,

2. Storing the stacks,

3. Storing input or output buffers for example, for speech or image.

c. Functions Assigned to the EEPROM o r

Flash

Storing non-volatile results of processing

d. Functions Assigned to the Caches

1. Storing copies of the instructions ,data and branch-transfer instructions

in advance from external memories

2. Storing temporarily the results in write back caches during fast processing

(v) Interrupts Handler

Interrupt Handling element for the external port interrupts, IO interrupts,

timer and RTC interrupts, software interrupts and Exceptions

(vi)Linking Embedded System Hardware

• LinkingandinterfacingcircuitfortheBusesbyusingtheappropriatemultiplexers,and

decoders,demultiplexers Interface the various system units

3. IO Communication Unit

a. CommunicationDriver(s):NetworkEthernetorserialdrivertocommunicatewith

Host embedded system Expansion Facility…

Serial Bus (es): For example, UART(512kbaud/s), 1-wireCAN(33 kbps),

Industrial I2C(100kbps),SMI2CBus(100kbps),SPI(100kbps),FaulttolerantCAN(110kbps),

Serial Port (230 kbps) , Micro Wire(300 kbps),SC SI parallel (40Mbps), Fast SC SI (8Mto80Mbps), UltraSCSI-3(8Mto160Mbps),Fire Wire/IEEE1394(400Mbps,72meter),HighSpeedUSB2.0 (480Mbps, 25 meter)

Parallel Bus(es) :PCI, PCI-X

b. Media IO Control Element

c. Keypad or Keyboard IO Interface

d. LCD Display System Interface

e. ADC–Single or Multichannel

f. DAC

g. GPIB Interface Element

h. Pulse Dialing Element

i. Modem

j. Bluetooth,802.11, IrDA,