

COA LAB EXP 15

Case study: ARM Processor.

The architecture of **ARM processor** is created by **Advanced RISC Machines**, hence name ARM. This needs very few instruction sets and transistors. It has very small size. This is reason that it is perfect fit for small size devices. It has less power consumption along with reduced complexity in its circuits.

They can be applied to various designs such as 32-bit devices and embedded systems. They can even be upgraded according to user needs.

The main features of ARM Processor are mentioned below :

1. **Multiprocessing Systems –**

ARM processors are designed so that they can be used in cases of multiprocessing systems where more than one processors are used to process information. First AMP processor introduced by name of ARMv6K had ability to support 4 CPUs along with its hardware.

2. **Tightly Coupled Memory –**

Memory of ARM processors is tightly coupled. This has very fast response time. It has low latency (quick response) that can also be used in cases of cache memory being unpredictable.

3. **Memory Management –**

ARM processor has management section. This includes Memory Management Unit and Memory Protection Unit. These management systems become very important in managing memory efficiently.

4. **Thumb-2 Technology –**

Thumb-2 Technology was introduced in 2003 and was used to create variable length instruction set. It extends 16-bit instructions of initial Thumb technology to 32-bit instructions. It has better performance than previously used Thumb technology.

5. **One cycle execution time –**

ARM processor is optimized for each instruction on CPU. Each instruction is of fixed length that allows time for fetching future instructions before executing present instruction. ARM has CPI (Clock Per Instruction) of one cycle.

6. Pipelining –

Processing of instructions is done in parallel using pipelines. Instructions are broken down and decoded in one pipeline stage. The pipeline advances one step at a time to increase throughput (rate of processing).

7. Large number of registers –

Large number of registers are used in ARM processor to prevent large amount of memory interactions. Registers contain data and addresses. These act as local memory store for all operations.

The ARM Microcontroller Assembly Level Programming:

The ARM cortex microcontroller is a 32-bit microcontroller therefore all instructions are 32-bit long which is executed in a single cycle. It consists of an instruction set to perform the arithmetic, logical and boolean operations. The ARM is a load-store architecture, then instructions are executed conditionally.

Syntax: Load a // a obtained the value from the place called a //
ADD12 // 12 is added to the load value a //
Store a // final value is stored in the variable a//

The assembly language programming is developed by the mnemonics such as ADD, SUB, MUL so on but for ARM programming, some extra instructions added such as ADCNES and SWINE, etc.

```
EX:                1.                ORG                0000h
MOV                r1,                #10
MOV                r2,                #15
ADD r3, r2, r1 // r3=r2+r1 and the final value stored in r3 register//

2.ORG                0000h
MOV                r1,                #10
MOV                r2,                #15
SUB r3, r2, r1 // r3=r2-r1 and the final value stored in r3 register//
```