"ARM7 Registers - Programmers Model"

11 August, 2022

* Explain all the registers of ARM ?

It has 37 registers.

Lec 07

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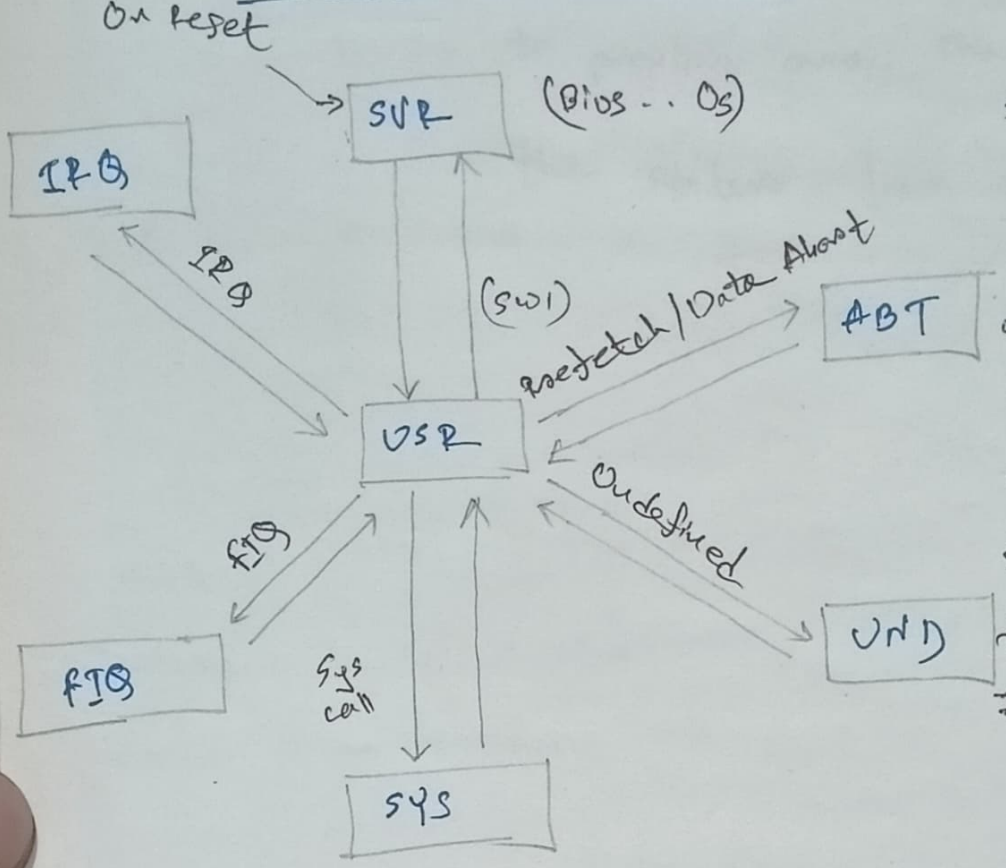
ARM7 - Operating Modes



There are seven operating modes in ARM.

1. SVR (Supervisor)
2. USR (user)
3. ABT (Abort)
4. UND (undefined)
5. SYS (System)
6. FIQ
7. IRQ

SVR (Supervisor Mode)

On reset when we switch on an ARM processor for the first time or beginning of the day it starts in supervisor mode.

on reset,

It executes a program called Bios (Basic Input Output system), it loads the operating system from primary memory to secondary memory then it starts the operating system and operating system works on input/output devices and display and others then it gives the user to use the system.

Everything happens in Supervisor Mode.

Then we it goes to users mode. we can not start from user mode. we must start from

supervisor mode.

~~We~~

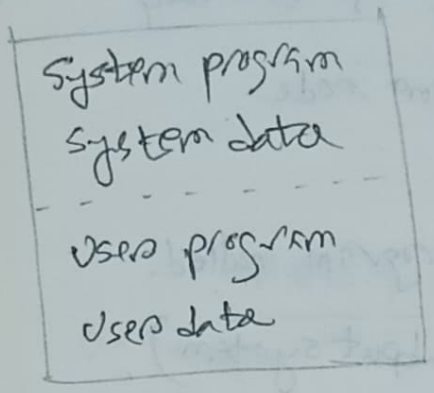
In ARM, in memory there are system program, system data and user ~~data~~ program, ~~data~~ user data.

System can use user program and data. but user should not use system program and data because security and virus problem.

Here introduces the protection system. called supervisor privilage and user privilage.

system program } supervisor privilage
system data }

User program } user privilage.
User data }



USR (User Mode)

User uses any system on user mode. More than 95 to 99 percent a user stays in user mode. It is the home mode

SYS (System Mode)

When a user wants to invoke some low level system function, it goes to system mode. System Mode gives the access to a user to enter system program and data in limited level. After finishing the operation it comes back to user mode.

IRQ, FIQ (Modes)

There are two types of interrupt IRQ and FIQ. When IRQ interrupt occurs it goes to IRQ Mode execute the IR ISR then back to user mode.

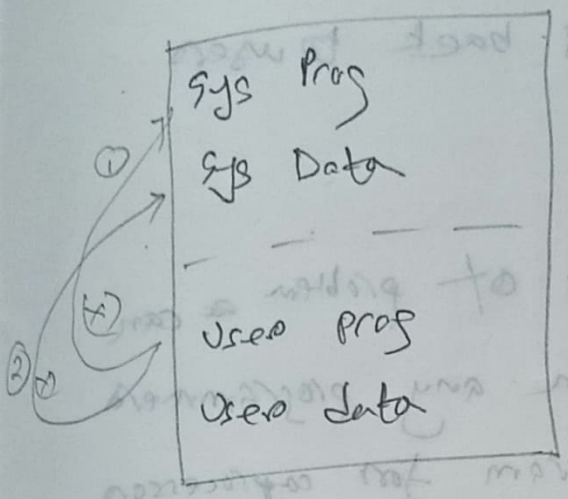
when FIQ interrupt occurs it goes to FIQ Mode, executes the ISR then back to user mode.

SWI (instruction)

If we want to access some crucial part of the system for example installing an app. The users wants to access system program and system data. The only way to access supervisor privilage is to use instruction SWI SWI (software Interrupt). After making necessary changes it backs to user mode

ABT (Abort mode)

Normally any user must not get any access to system data and program. If any instruction of user mode tries to get access to system the processor goes to Abort Mode.



In Abort Mode, the application is discarded/killed which is trying to get access the system. than
And goback to User mode.

There are two types of Abort

1. prefetch Abort
(when a to access system prog)

2. Data Abort
(tries to access system data)

→ (in pipeling) fetching in advance so it is called prefetch.

UND (Undefined Mode)

Processor fetches an instruction but can not did decoding the opcode. Means the instruction does not belongs to ARM7 instruction set. then the processor

goes to Undefined Mode and discard the instruction and comes back to user mode.

This types of problem can arise when any programmer write program for coprocessor with ARM. But he/she forgets to add the coprocessor. In that case ARM will try to execute that instruction. But as that type of instruction does not belong to ARM instruction set processor will go to Undefined Mode. After discarding the instruction it will back to user Mode.