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Subject System Programming

Title Types of Registers

- Register

A register is a small amount of storage available as a part of a CPU or other logical Device. Registers usually consists of a small number of flip-flops, and are used to hold data or instructions for quick access.

- Types of Registers

Registers are categorized with respect to user's accessibility, in two types.

↳ General Purpose Registers (GPR)

A gereral-purpose register is used to store data and information / instructions during the program execution

The Data stored in GPR can be from mathematical expression, to the address of a memory location. GPRs are found in all CPUs.

The general purpose registers are ;

↳ RAX - Accumulator

The 64-Bit Architecture has a unique register, RAX, which functions as an accumulator for calculations. Other registers support the accumulator, and it is beneficial to do most of the work in accumulator.

↳ RDX - The Data Register

The Data Register is most closely tied to the accumulator (RAX) and is used for storing data, related to accumulator's calculations.

↳ RCX - The Count Register

The RCX Register is used for counting in 64-Bit machines, and also for string operations. It is the most obvious choice for the loop counter.

↳ RDI - The Destination Index

The RDI is a pointer that holds the address of, where data should be written, in memory.

The STOS instruction is used to write data from the accumulator to memory and increment the destination index (RDI)

It is important to use the RDI for what it is designed for, which is writing data to memory rather than using it for extra storage.

↳ RSI : The Source Index

The ESI is not as powerful as RDI, as it is not used for writing. However, it is just as powerful when it comes to reading data.

In situations where our code doesn't read any sort of data, the RSI can be used for convinient storage.

↳ RSP and RBP - The Stack and Base Pointer

These are widely used registers. These registers are essential for function-call mechanism. When the function is called, the parameters are 'push'ed, and return address is returned onto the stack.

The function then sets the 'RBP = RSP' and places its internal variables on stack.

From that point, the function refers to its parameters and variables, relative to the RBP.

↳ RBX - The Base Register

RBX is used in 16-Bit mode. In default mode, any register can be used as a memory offset, so RBX is no longer unique.

The RBX gets its name from XLAT instruction, which looks up a value in a table using AL as the index, and RBX as base.

Hence, RBX is the only register without an important dedicated purpose.

↳ Others - Temporary Data Registers

These include ; r8, r9, r10, r11, r12, r13, r14, r15.

↳ Special Purpose Registers

These registers have a specific function in CPU. These include ;

↳ Code Segment ↳ Data Segment ↳ Stack Segment
↳ Extra Segment ↳ File Segment (FS) ↳ GS
↳ Extended Instruction Pointer
↳ Flag Register