# Contiguous Memory Allocation – Address Translation

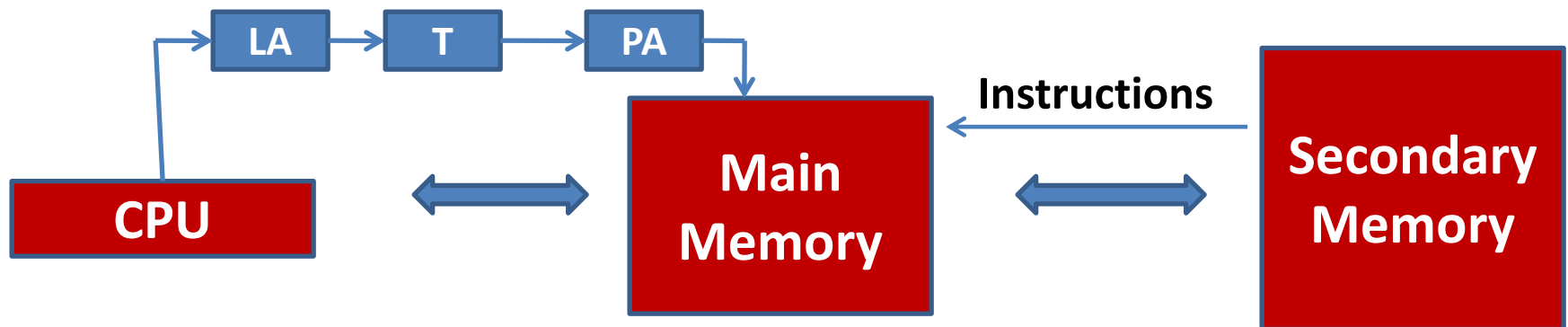By
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# Basics of Address Translation

- Address Translation: CPU generates logical address(LA). This LA is used to access secondary memory. For main memory we require physical address (PA). Therefore required address translation from LA to PA.

# Address Translation

CPU always generates a logical address.

A physical address is needed to access the main memory.

**Following steps are followed to translate logical address into physical address-**

## Step-01:

The translation scheme uses two registers that are under the control of operating system.

During context switching, the values corresponding to the process being loaded are set in the registers.

These two registers are-

**1) Relocation Register:** stores the base address or starting address of the process in the main memory.

**2) Limit Register:** stores the size or length of the process.

# Address Translation

**Step-02:**

CPU generates a logical address containing the address of the instruction that it wants to read.

**Step-03:**

The logical address generated by the CPU is compared with the limit of the process.

Now, two cases are possible-

**Case-01: Generated Address >= Limit**

If address is found to be greater than or equal to the limit, a trap is generated.

This helps to prevent unauthorized access.

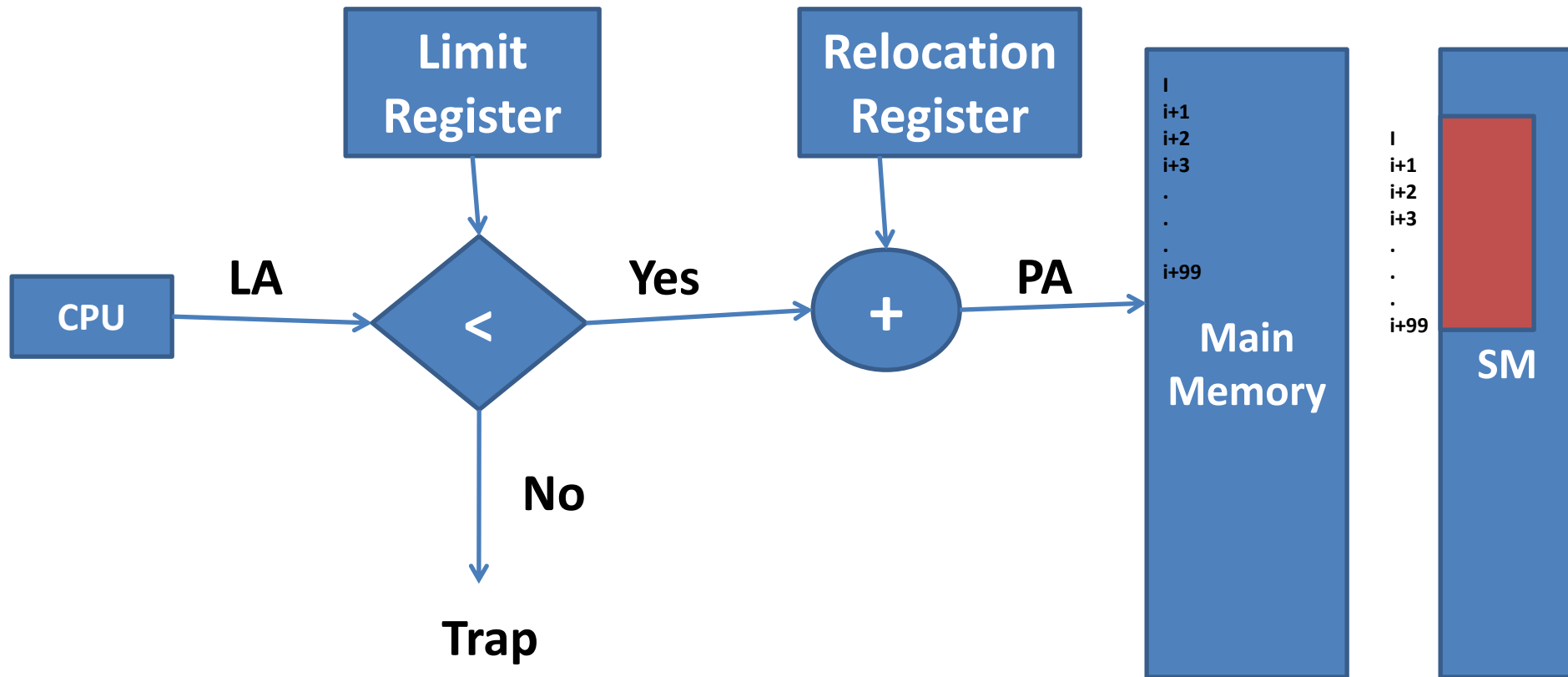**Case-02: Generated Address < Limit**

The address must always lie in the range.

If address is found to be smaller than the limit, then the request is treated as a valid request.

Then, generated address is added with the base address of the process.

The result obtained after addition is the address of the memory location storing the required word.

# Address Translation

# Address Translation

| | Limit Register | Relocation Register | Request for instruction | Validity | Calculated address |
|---|---|---|---|---|---|
| P0 | 500 | 1200 | 450 | Yes | 1650 |
| P1 | 275 | 550 | 300 | No | Trap |
| P2 | 212 | 880 | 210 | Yes | 1090 |
| P3 | 420 | 1400 | 450 | No | Trap |
| P4 | 118 | 200 | 80 | Yes | 280 |

# Defragmentation

- Compaction, or defragmentation, is a technique that reduces the amount of fragmentation in memory. It does this by physically rearranging the processes in memory to store the allocated regions contiguously.

- A simple form of compaction simply scans all of memory and moves every allocated region to form a contiguous chunk.

- This creates a large regions of free space to impede the return of fragmentation.

- However, compaction can be an expensive and slow process since large amounts of memory may need to be moved.

# Thank You