Micro Processors & Interfacing

16CS307

Unit- 3 : Advanced Processors

Memory Management Unit

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3.6.1. Real Addressing Mode of 80386

- After reset, the 80386 starts from memory location **FFFF FFF0** H under the real address mode.
- In the real mode, **80386** works as a **fast 8086** with 32-bit registers and data types.
- In real mode, the default operand size is 16-bit but 32- bit operands and addressing modes may be used with the help of override prefixes.
- The segment size in real mode is 64KB; hence the 32-bit effective addressing must be less than 000FFFFF H.
- The Real mode initializes the 80386 and prepares it for protected mode.

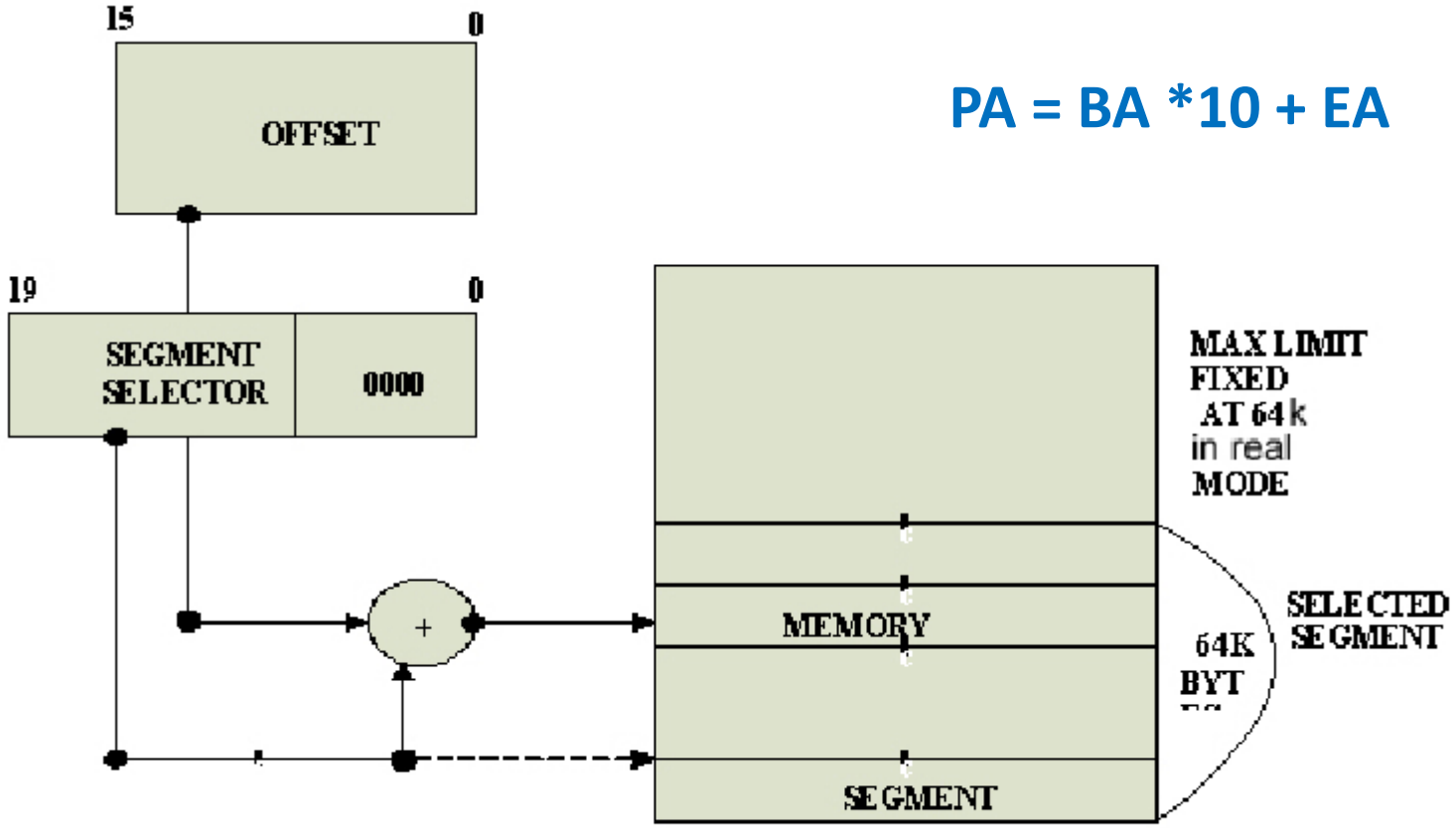
3.6.1. Memory Addressing in Real Mode :

- In the **Real mode**, the 80386 can address at the most **1MB** of physical memory using address lines A0-A19.
- **Paging unit is disabled** in real addressing mode, and hence the Real Addresses are the same as the Physical Addresses. **PA = RA**
- To form a physical memory address, appropriate segment registers contents (16-bits) are shifted left by four positions and then added to the 16-bit offset address formed using one of the addressing modes, in the same way as in the 80386 real address mode. **PA= BA*10 + EA**
- The segment in 80386 real mode can be read, write or executed, i.e. no protection is available.
- Any fetch or access past the end of the segment limit generates exception 13 in real address mode.
- The segments in 80386 real mode may be overlapped or non-overlapped.
- The interrupt vector table of 80386 has been allocated 1Kbyte space starting from **00000H to 003FFH**.

3.6.1. Real Addressing Modes of 80386

Similar to 8086

PA = BA *10 + EA



Physical Address Formation In Real Mode Of 80386

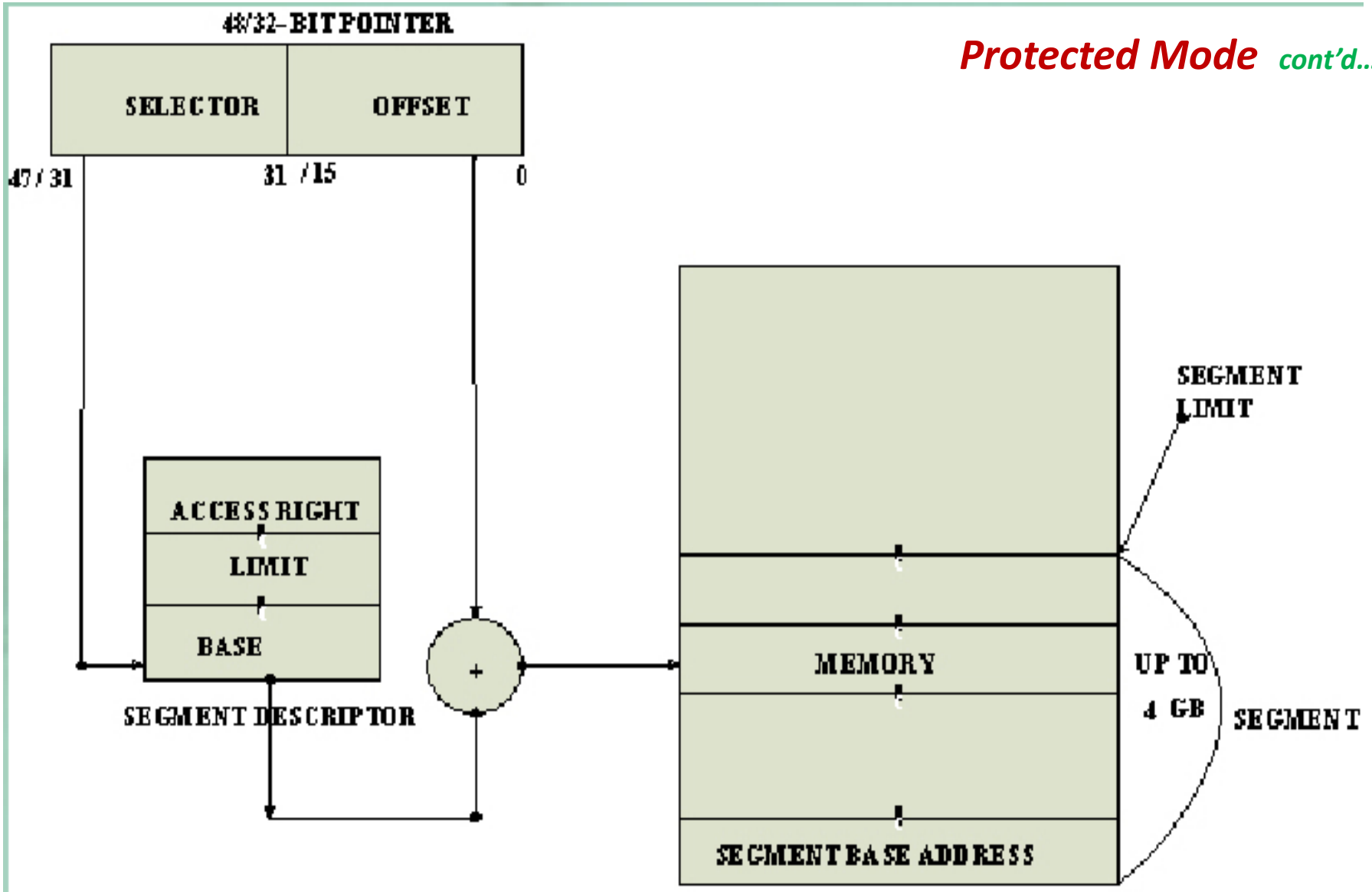
3.6.2. Protected Mode of 80386

- All the capabilities of 80386 are available for utilization in its protected mode of operation.
- The 80386 in protected mode support all the software written for 80286 and 8086 to be executed under the control of memory management and protection abilities of 80386.
- **MMU :**
  - **Segmentation**
  - **Paging**

3.6.2. Addressing in Protected Mode

- In Protected mode, the contents of **segment registers are used as selectors to address the descriptors** which contain the **segment limit, base address and access rights** byte of the segment.
- The effective address (offset) is added with segment base address to calculate **Linear address**.
- This linear address is further used as physical address, if the paging unit is disabled; otherwise the paging unit converts the linear address into physical address.
- The paging unit is a memory management unit, enabled only in protected mode.
- The **paging** mechanism **allows handling of large segments of memory** in terms of pages of **4KB** size.
- The paging unit **operates under the control of segmentation unit**.
- The paging unit if enabled converts linear addresses into physical address, in protected mode.

Protected Mode *cont'd...*



Protected Mode Addressing Without Paging Unit