

Operating System: TLB Set Associative Mapping

By: Vishvadeep Gothi



VISHVADEEP GOTHI SIR

**AIR- 19, 119, 440, 682
in GATE**



**ME from IISc Bangalore
Mtech BITS Pilani in Data
Science**



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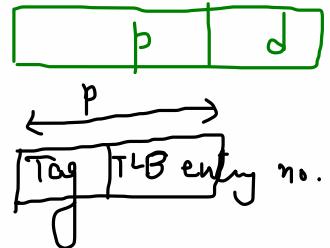
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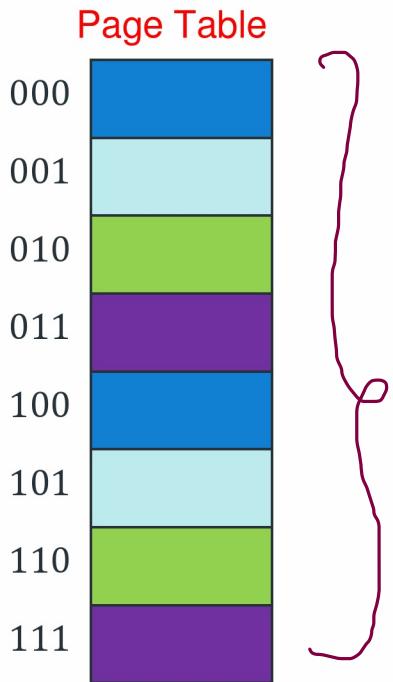
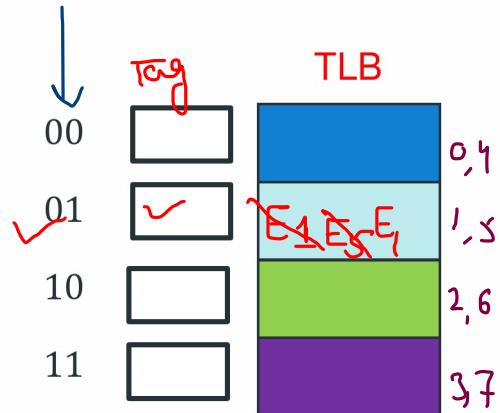
↳ Direct mapping



Direct Mappings



Problem With Direct Mappings

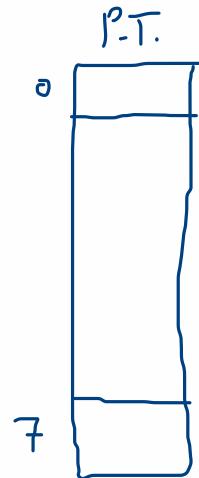
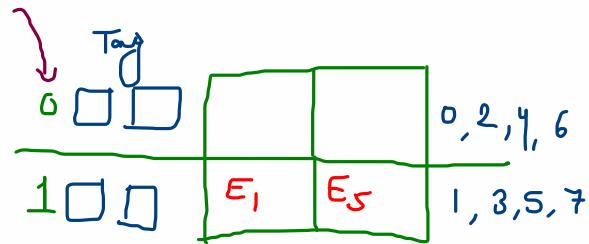


if CPU generates request,
page no. 1

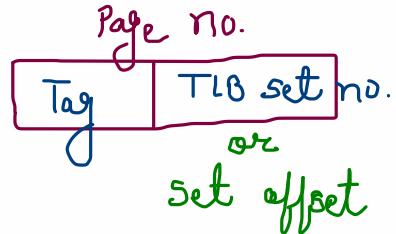
1, 5, 1, 5, 1, 5, ...
↳ TLB miss

Set Associative Mappings

2-way set associative



Set Associative Mappings



Bits in TLB set no. = $\log_2(\text{no.-of sets in TLB})$

$$\text{no. of sets in TLB} = \frac{\text{no.-of entries in TLB}}{k}$$

where

k = associativity

for k -way set associative



Set Associative Mappings

Ques) L.A. = 20-bits

$$\text{Page size} = \underline{256 \text{ bytes}} = 2^8 \text{ B}$$

TLB size \Rightarrow 512 entries

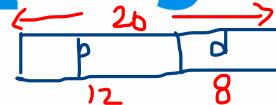
4-way set associative

Tag-bits = ?

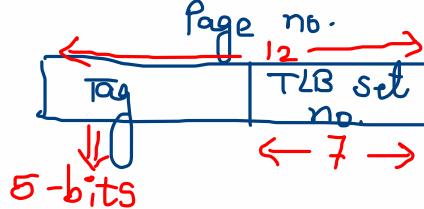
Ans = 5-bits

So?

L.A. .



Page no.



$$\text{no. of sets in TLB} = \frac{512}{4}$$

$$= \frac{2^9}{2^2}$$

$$= 2^7$$

↓

Set offset = 7-bits

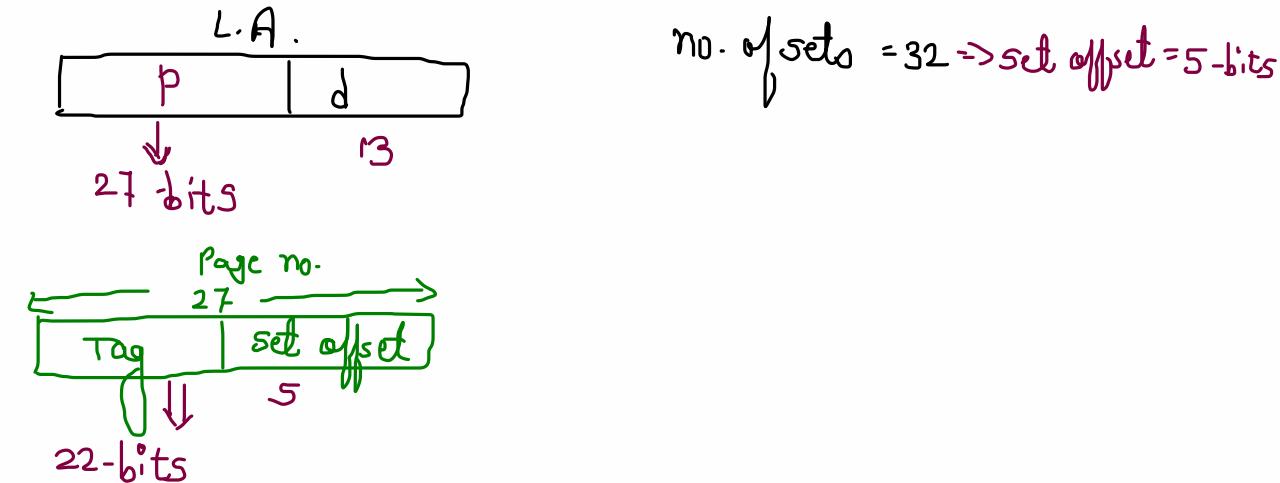
Question GATE-2015

page size = $8 \text{ kB} = 2^{13} \text{ B}$

page offset = 13 bits

A computer system implements a 40 bit virtual address, page size of 8 kilobytes, and a 128-entry translation look-aside buffer (TLB) organized into 32 sets each having four ways. Assume that the TLB tag does not store any process id. The minimum length of the TLB tag in bits is _____?

- (A) 20
- (B) 10
- (C) 11
- (D) 22

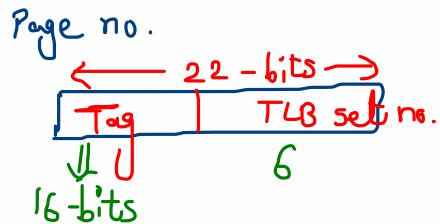
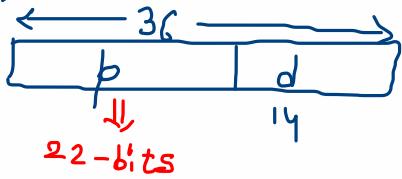


Question

$$\text{Page size} = 16\text{KB} = 2^{14} \text{B} \Rightarrow \text{page offset} = 14\text{-bits}$$

A Computer system implements a 36-bits virtual address, page size of 16Kbytes and a 256-entry TLB organized into 64 sets each having 4-ways. Assume that the TLB tag does not store any process-id. The minimum length of the TLB tag in bits is _____?

L.A.



$$\text{Ans} = 16\text{-bits}$$

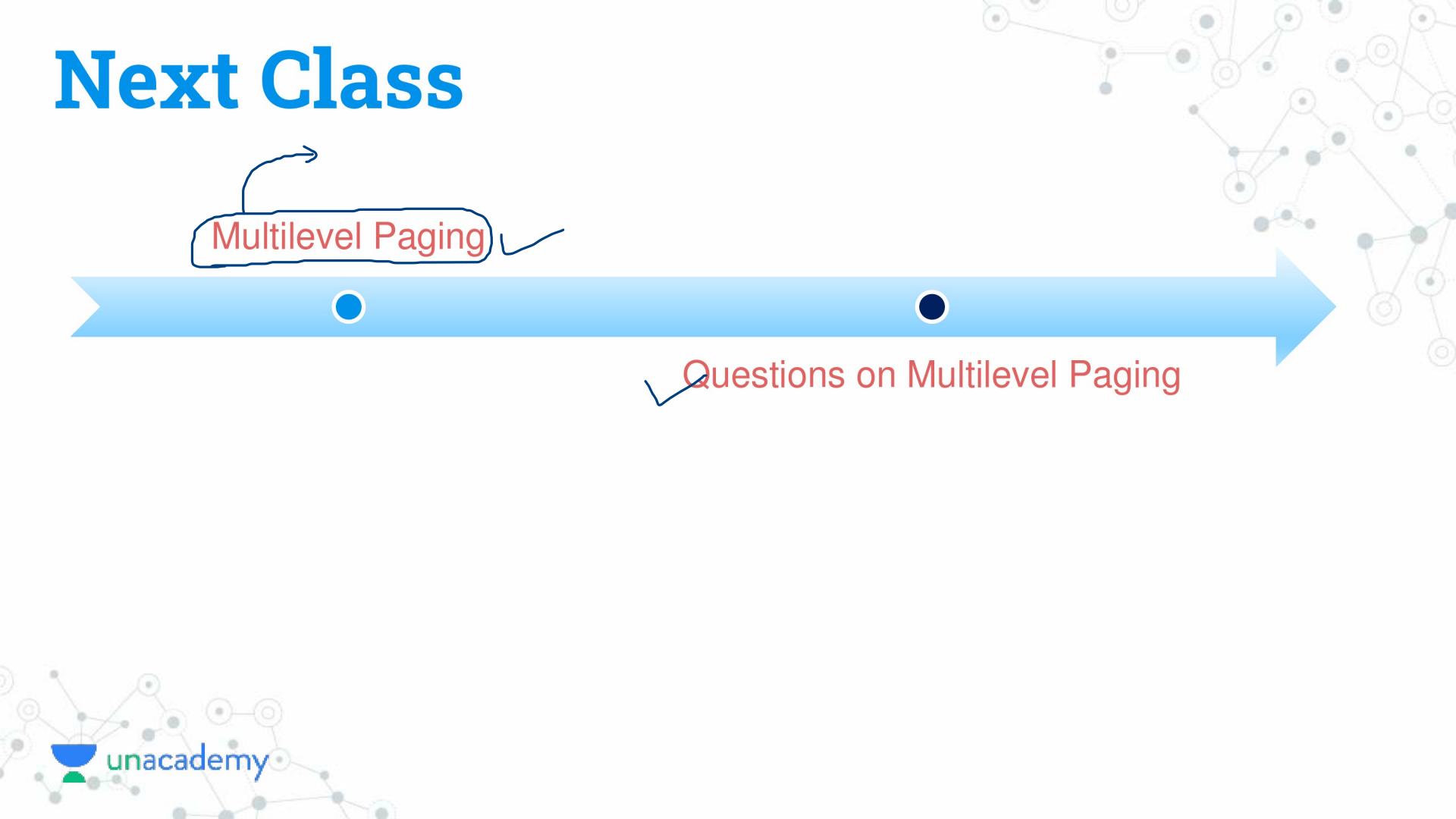
$$\text{no. of sets} = 64 = 2^6 \Rightarrow \text{set offset} = 6\text{-bits}$$

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Multilevel Paging



✓ Questions on Multilevel Paging



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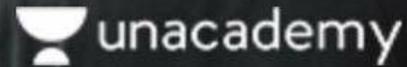
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✓ HOW TO MAKE NOTES

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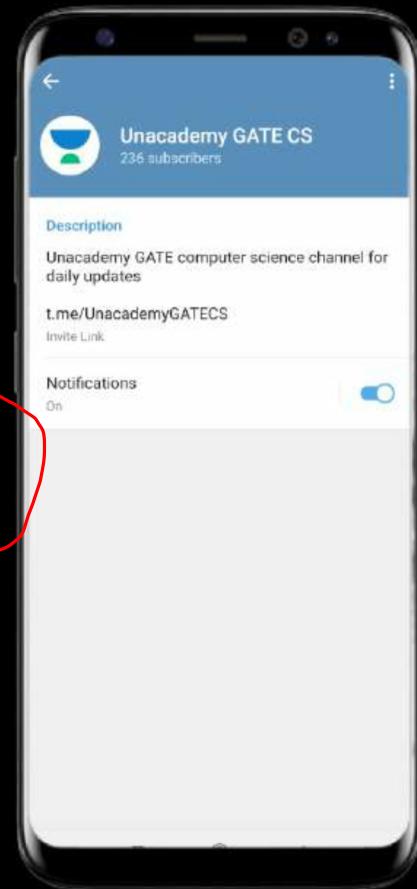
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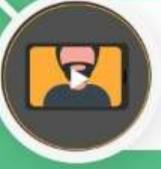
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