

Operating System: TLB Mapping and Tags

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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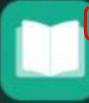
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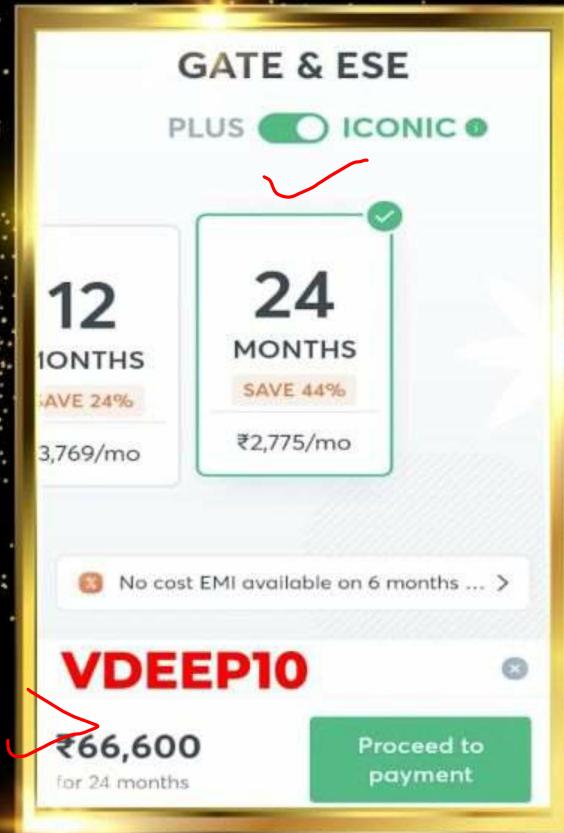
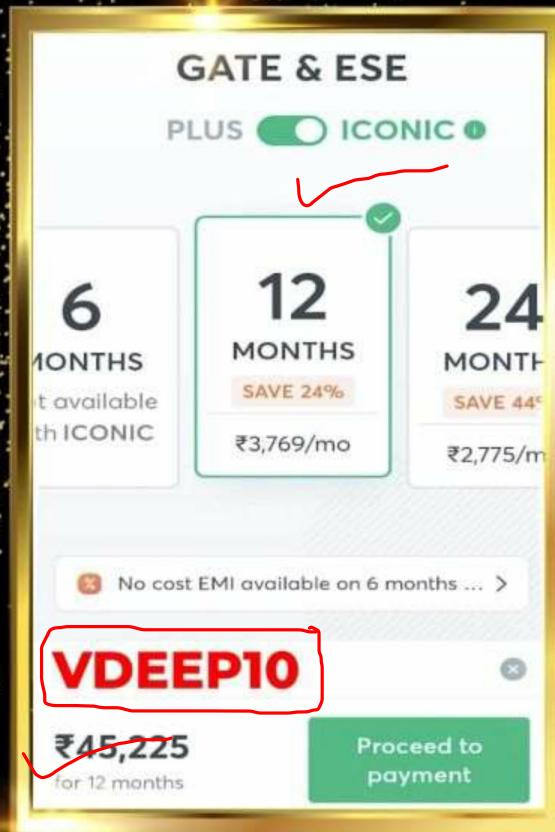
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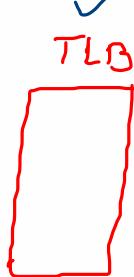
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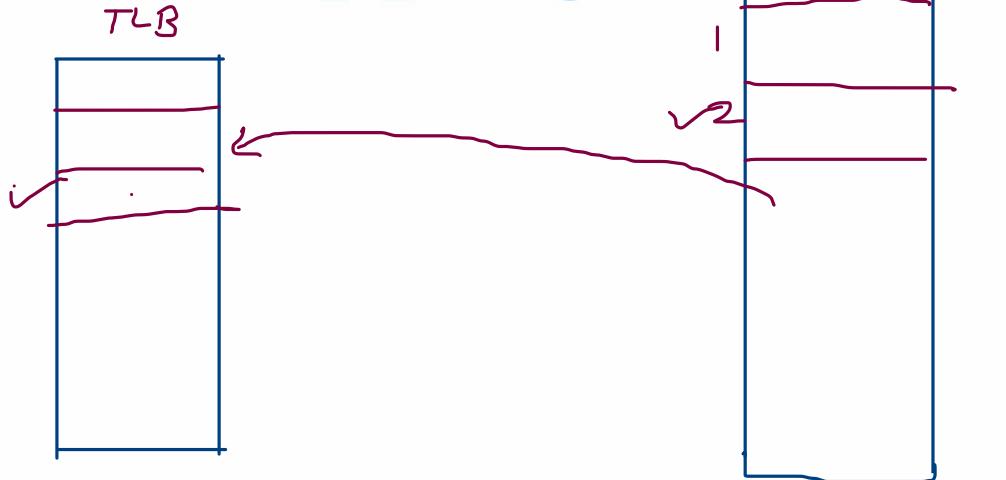
TLB

A translation lookaside buffer is a memory hardware that is used to reduce the time taken to access a user memory location

TLB is searched
using page no.
of logical add.



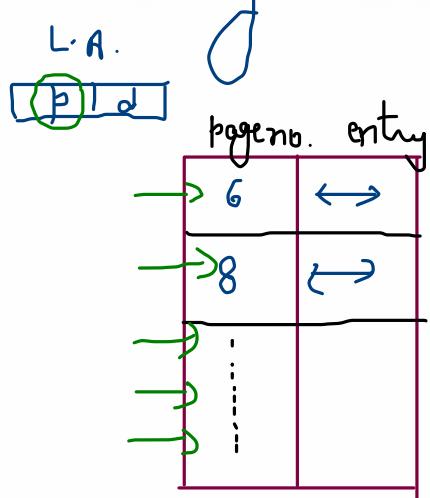
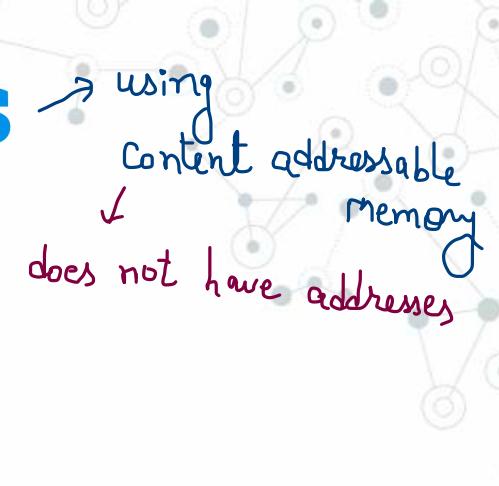
TLB Mappings



{ pattern to bring p.T.
entry into TLB.
mapping

1. Direct mapping
2. Set-associative mapping
3. Fully associative mapping

Full Associative Mappings

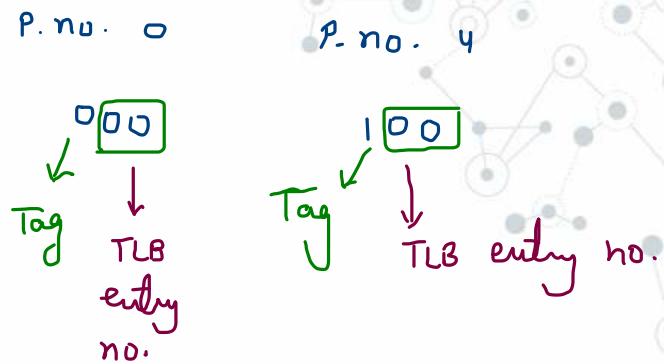
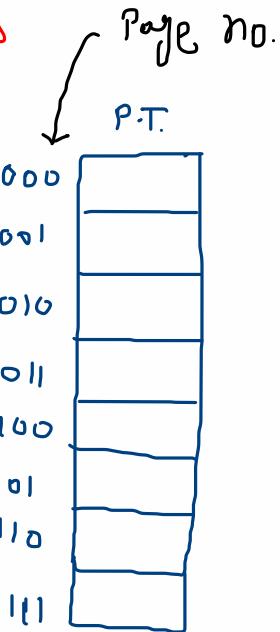
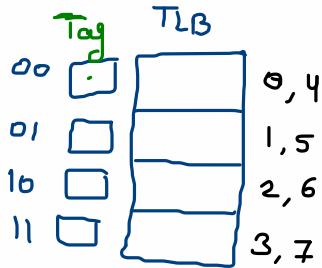


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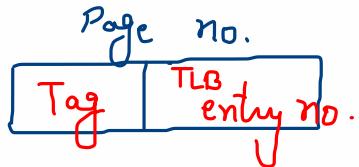
Direct Mappings *

TLB can store \Rightarrow 4 entries

P.T. can store \Rightarrow 8 entries



Direct Mappings



Bits for

$$\text{TLB entry no.} = \log_2 (\text{no. of entries in TLB}) - \text{bits}$$

$$\text{Total tag-directory size} = \underset{\text{in TLB}}{\text{No. of entries}} * \text{Tag-bits}$$

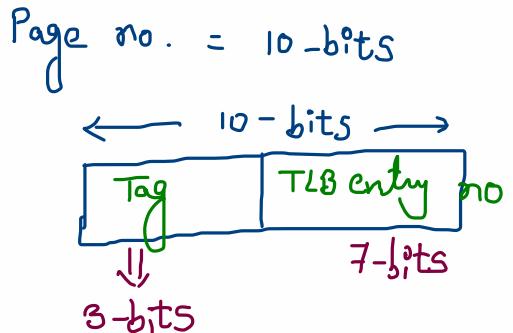


Direct Mappings

Ans = 3-bits

Ques) A paging system has a TLB with 128 entries in Page Table. If TLB uses direct mapping, then no. of tag-bits in a page no. ?

Soln



Tag directory size = $128 * 3\text{-bits}$

Direct Mappings

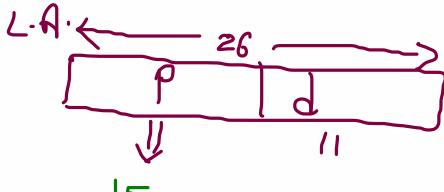
② L.A.S. = 64MB = 2^{26} B

Page size = 2KB = 2^11 B

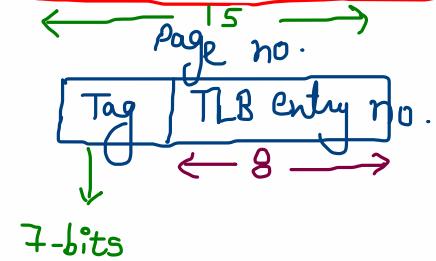
TLB with 256 entries

Direct mapping

Tag-bits = ?



Ans = 7-bits



Tag directory size = $256 * 7\text{-bits}$

③

$$\text{L.A.S.} = 128 \text{ MB}$$

$$\text{Page size} = 4 \text{ KB}$$

$$1 \text{ Page table entry} = 4 \text{ bytes}$$

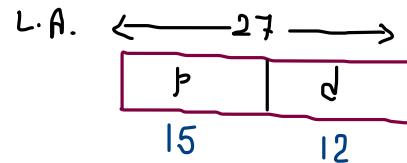
$$\text{TLB size} = 1 \text{ Kbytes}$$

1. P.T. size

2. Tag directory size

$$2. \text{ Tag directory size} = 2^8 * 7\text{-bits}$$

$$\text{L.A.S.} = 128 \text{ MB} = 2^{27} \text{ B} \Rightarrow \text{L.A.} = 27\text{-bits}$$



$$\text{Page} = 4 \text{ KB} = 2^{12} \text{ B}$$

↓

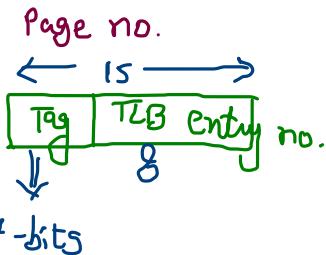
d = 12-bits

$$1. \text{ Page table size} = 2^{15} * 4 \text{ B}$$

$$= 2^{17} \text{ B}$$

$$= 128 \text{ KB}$$

$$\text{No. of entries in TLB} = \frac{1 \text{ KB}}{4 \text{ B}} = 2^8$$



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Set Associative Mapping



GATE PYQ on Mapping





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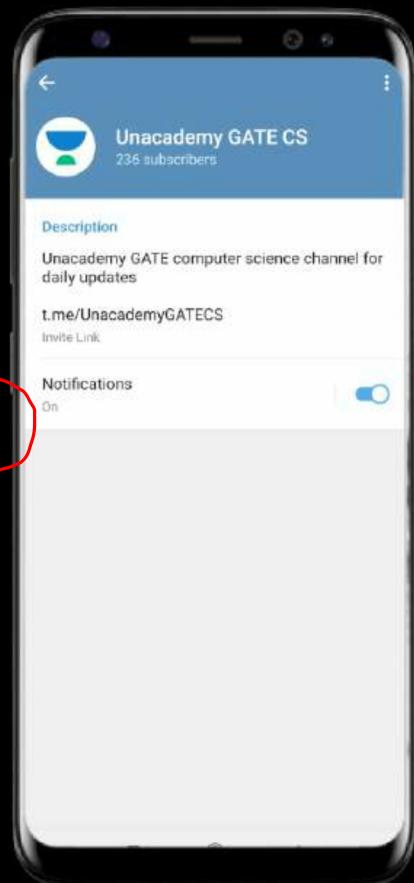
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6
MONTHS

Not available
with ICONIC

12
MONTHS

SAVE 24%
₹3,769/mo

24
MONTHS

SAVE 44%
₹2,775/mo

 No cost EMI available on 6 months ... >

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PLUS  ICONIC

12
MONTHS

SAVE 24%
₹3,769/mo

24
MONTHS

SAVE 44%
₹2,775/mo

 No cost EMI available on 6 months ... >

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