





# Computer Organization & Architecture

**Cache Replacement Policies – MRU, LRU, Pseudo-LRU, LFU**



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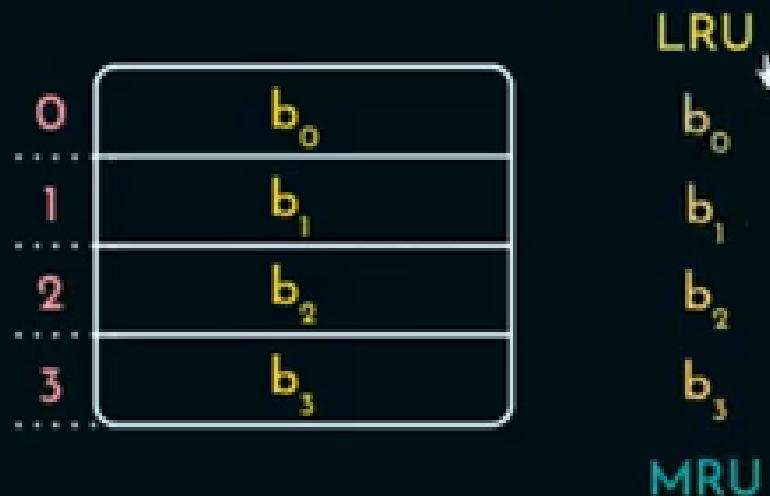
Recency  
Based  
Policies



## b. Least Recently Used:

- Exploits **Temporal Locality**.
- Evicts **least recently referred block**.

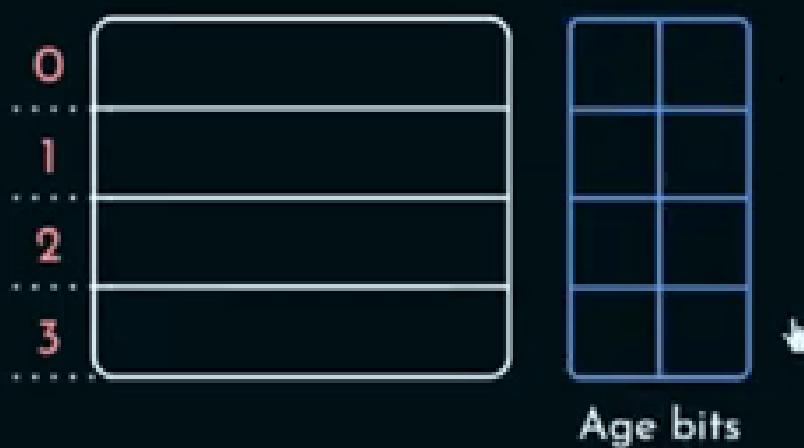
Block Requests :      0, 1, 2, 3, 4, 2, 3, 1, 5, 6



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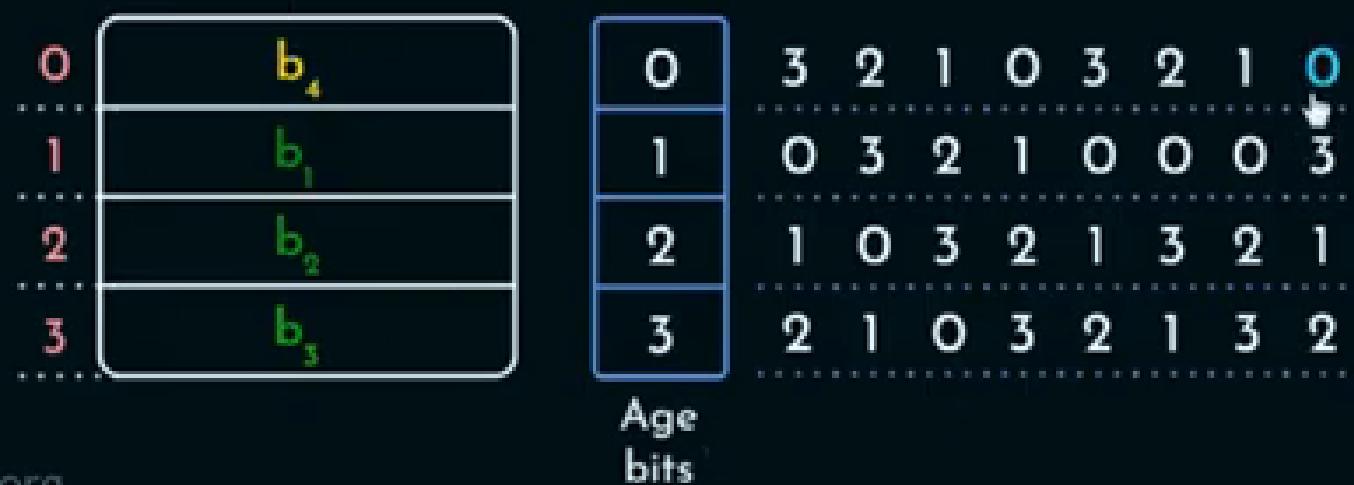
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- Rigorous use of **Age** bits.

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## b. Least Recently Used:

- Exploits **Temporal Locality**.
- Evicts **least recently referred block**.
- Rigorous use of **Age bits** & **sequence** of Age bits.



Block Requests : 0, 1, 2, 3, 4, 2, 3, 1, 5, 6, 5

0	.....	2	(0, 1, 2, 3)	4	Total no. of sequences
1	.....	1	(0, 1, 3)	3	$= 4 \times 3 \times 2 \times 1 = 4!$
2	.....	3	(0, 3)	2	$\lceil \log_2(4!) \rceil = 5$ (per set)
3	.....	0	(0)	1	$\lceil \log_2(8!) \rceil = 16$ (per set)

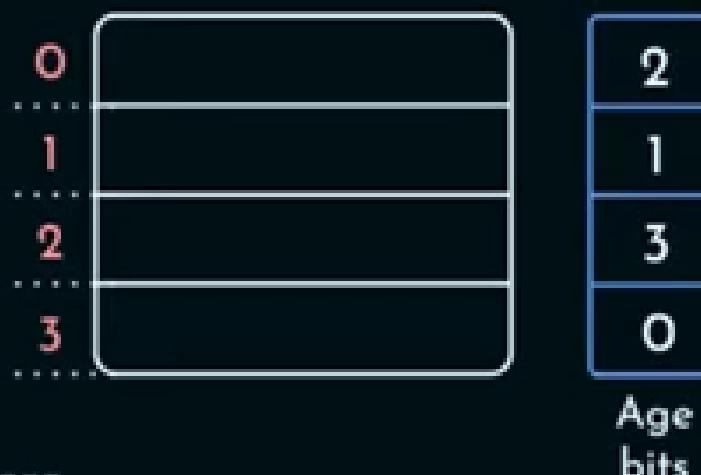
Age bits

## b. Least Recently Used:

- Exploits **Temporal Locality**.
- Evicts **least recently referred block**.
- Rigorous use of **Age bits** & **sequence** of Age bits.

HUGE  
OVERHEAD  
for Caches with  
Higher  
Associativity

Block Requests : 0, 1, 2, 3, 4, 2, 3, 1, 5, 6, 5



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c. Pseudo-Least Recently Used:



### c. Pseudo-Least Recently Used:

-- Generates approximate measures for replacements.

Block Requests : 0, 1, 2, 3, 4, 5, 6, 7, 2, 1, 9, 8

0→ Down

1→ Up



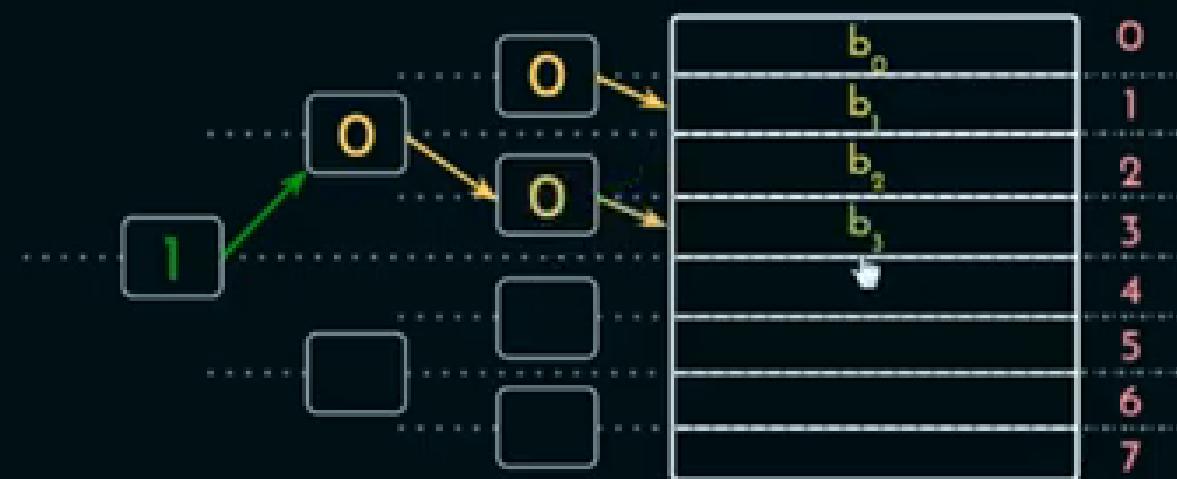
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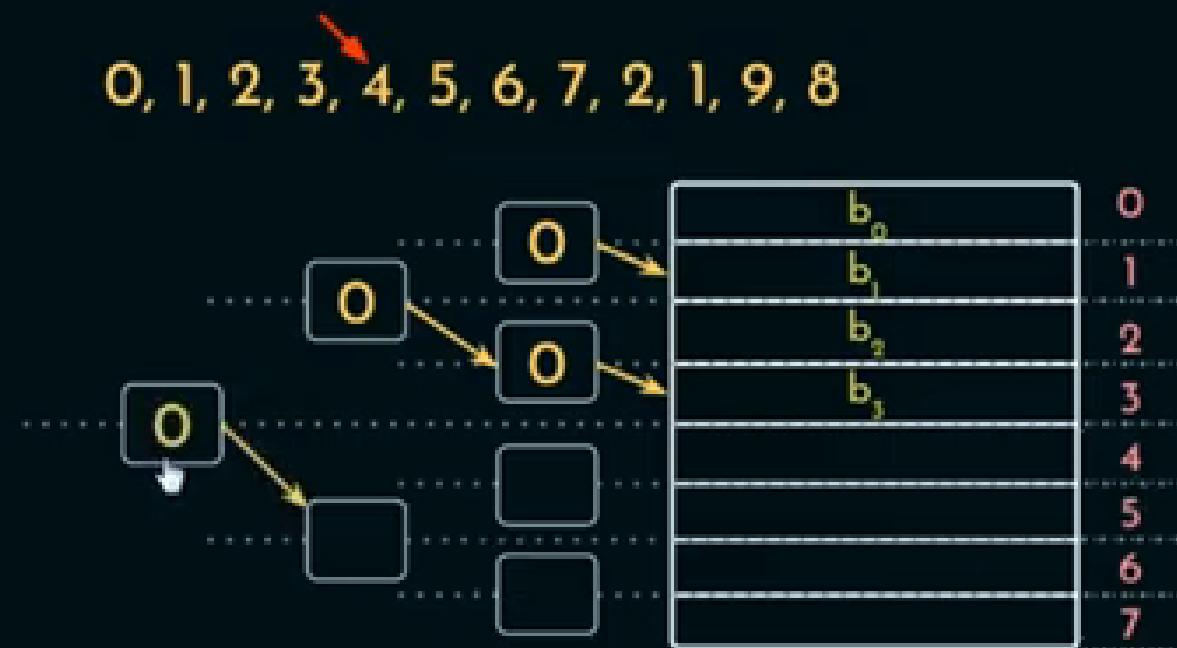
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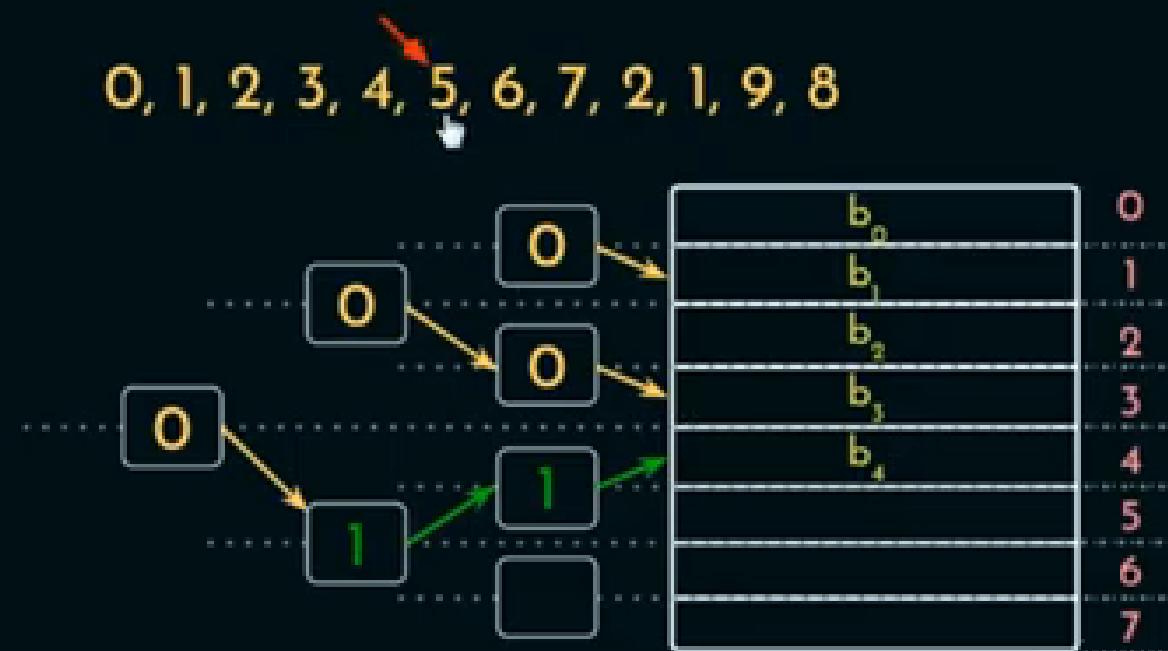
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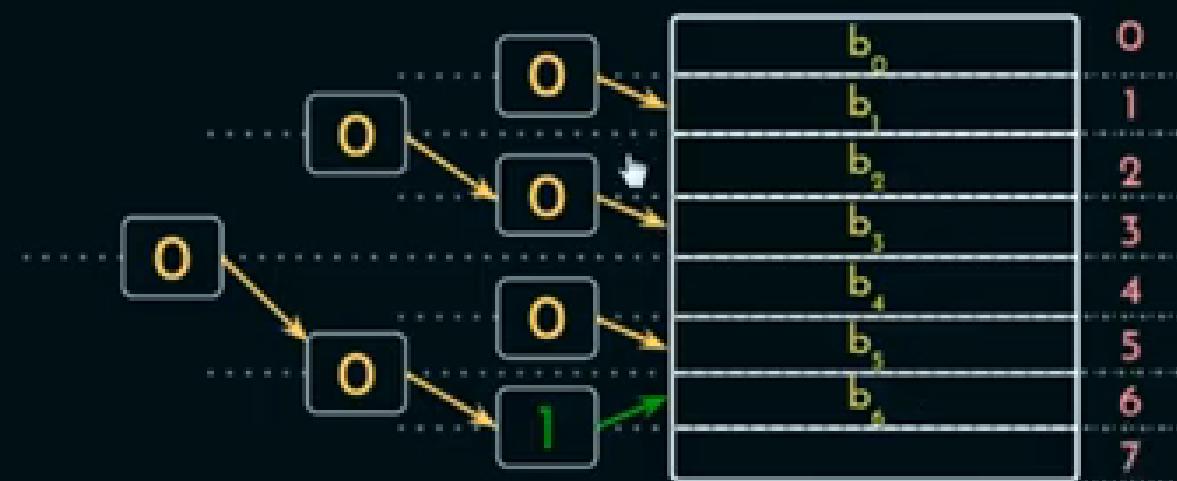
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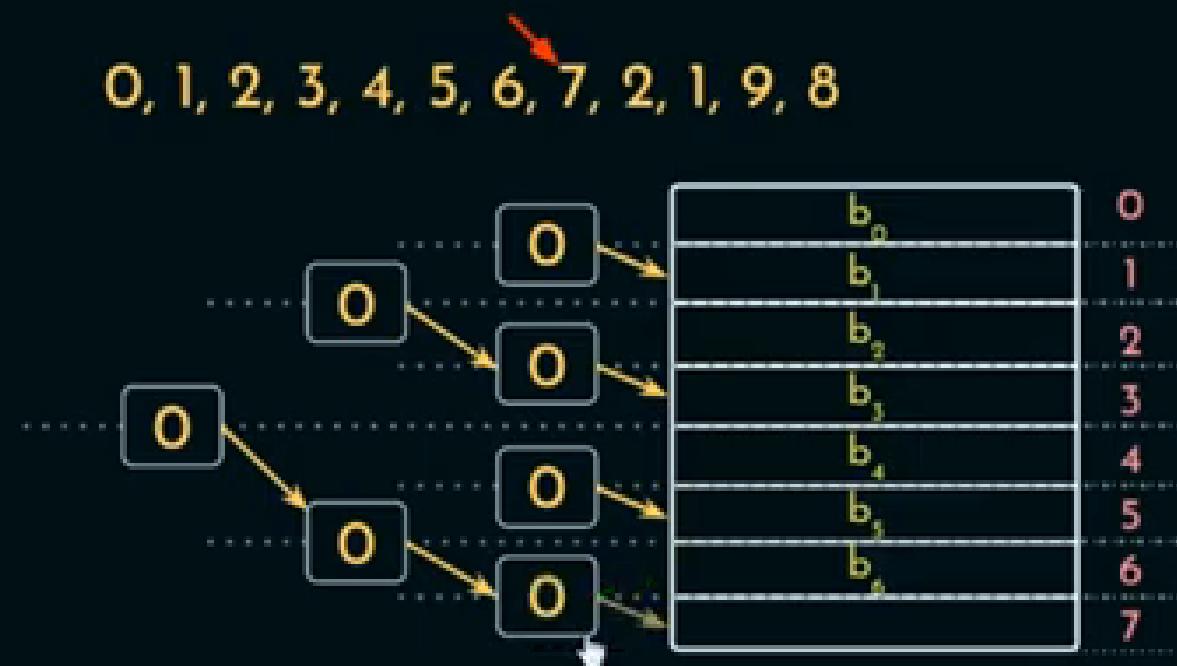
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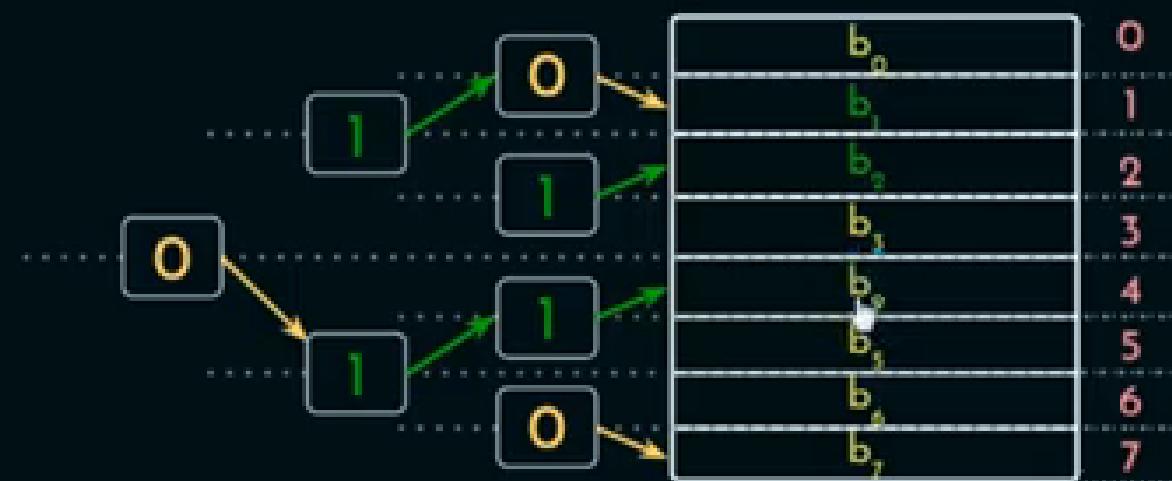
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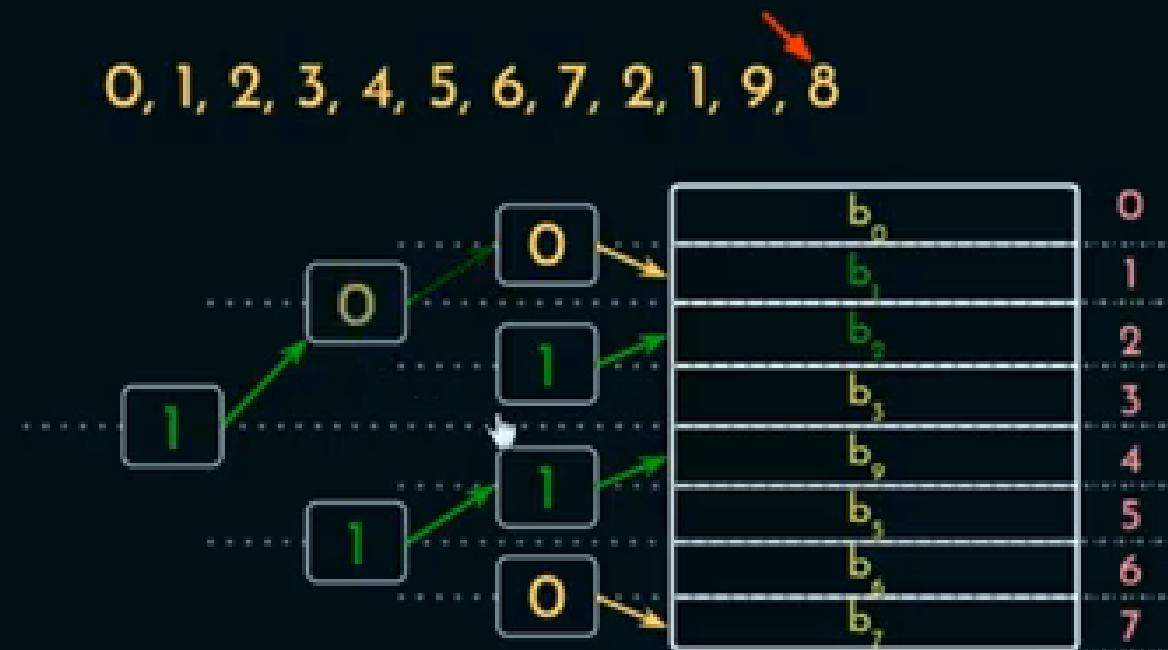
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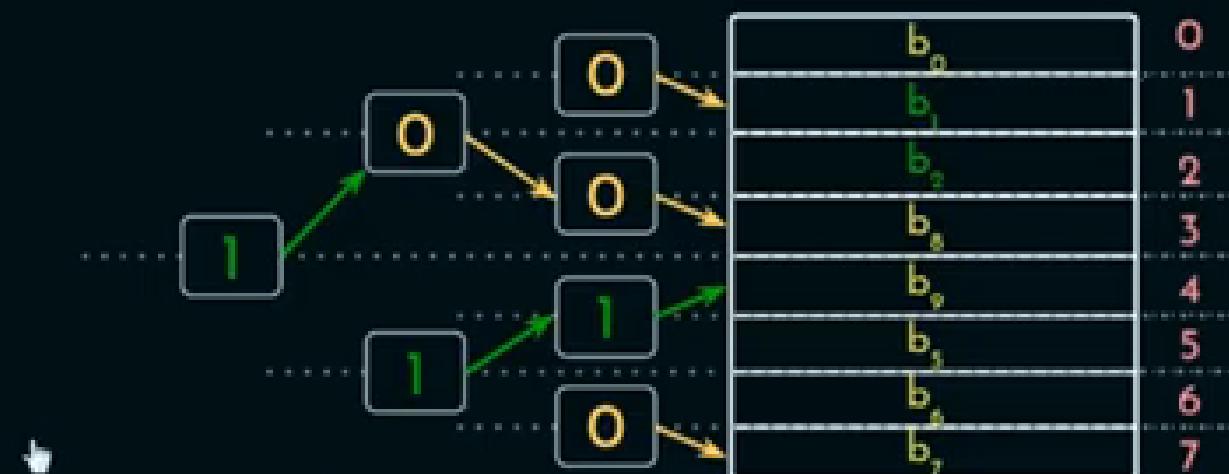
- Generates approximate measures for replacements.
- Lesser no. of bits are needed.
- Reduced implementation cost.

Block Requests : 0, 1, 2, 3, 4, 5, 6, 7, 2, 1, 9, 8

0 → Down

1 → Up

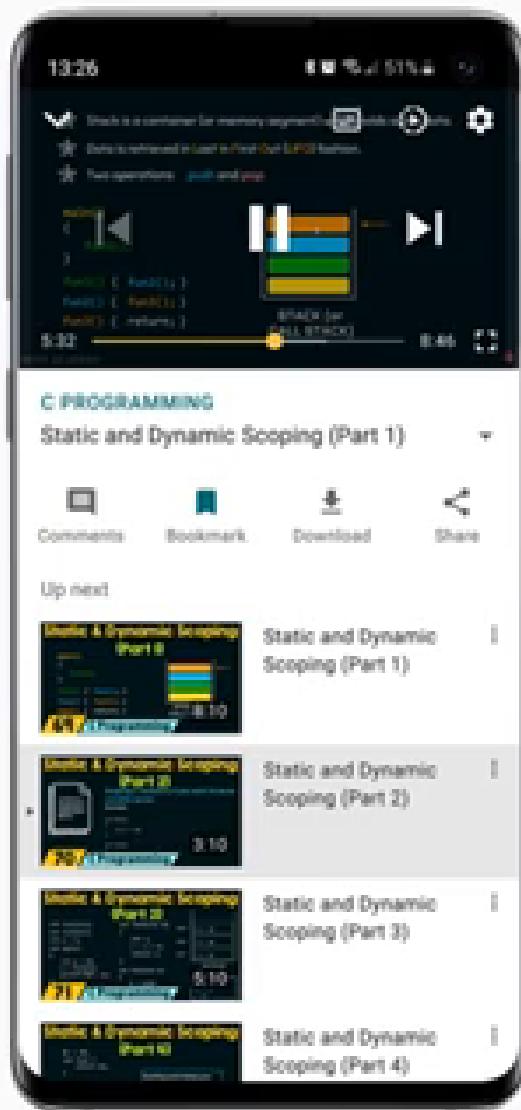
MRU:



## → Frequency Based Policy:

- Least Frequently Used:





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