Roll: 1605023

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answer to the ques No. 1

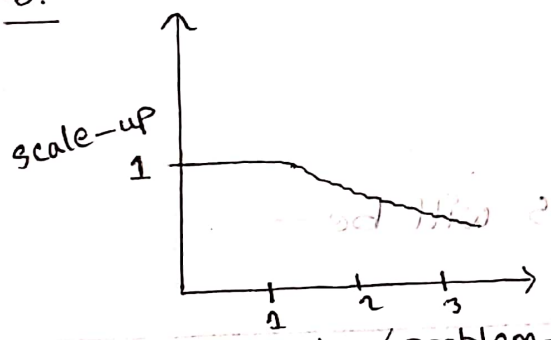
a. Here, $P = 1 - 0.2 = 0.8$ as $1 - P = 20\% = 0.2$.

i. $\text{scale-up} = \frac{T_S}{T_L} = \frac{T}{(1-P).nT + P.T} = \frac{1}{(1-P).n + P} = 1$

ii. $\text{scale-up} = \frac{1}{0.2 \times 2 + 0.8} = 5/6$

iii. $\text{scale-up} = \frac{1}{0.2 \times 3 + 0.8} = \frac{1}{1.4} = 5/7$

b.



The scale-up goes from linear to sublinear after increasing problem size and node number. This is due to sequential tasks and multiple processes' start-up cost.

Ans.

Ans to the ques No. 2

Here, employee tuples are partitioned based on their salary values across 8 nodes as per the given partition vector. Here, the query is a range query and inquired on partition attribute salary. So, the query will be processed only in those nodes which contain corresponding salary range. In this case, n0 to n4 will not process this query as salary range greater than or equal to 55,000 only lies in n5–n7. So, n5–n7 nodes will be accessed and process the query while n0–n4 will be available for other queries.

Ans.

Ans to the ques No. 3

Here, real nodes are N_1, N_2, N_3, N_4, N_5.
So, virtual nodes will be $V_1, V_2, \dots, V_{100}$.
So, we will partition person relation based on age attribute in 100 virtual nodes, that is, there will be 100 virtual partitions.

Here,
partition vector : $P_V = [V_0, V_1, V_2, \dots, V_{98}]$.
age ranges between 1 and 100.
So, we can set range/partition vector in such a way that each virtual partition contains tuples for a specific age.

So, $Pv = [1, 2, 3, \dots, 99]$.

So, lower 2 and upper 2 partitions will be —

P_0 for age < 1.
P_1 for age $- 1 \leq$ age < 2.
— — — — —
P_{98} for $98 \leq$ age < 99
P_{99} for $99 \leq$ age.

We may have to relocate heavily loaded tuples to less loaded node!

algorithm

i. prepare part. vector for virtual nodes ✓
ii. partition tuples based on i. vector ✓
iii. partition v. nodes to real nodes using round-robin partitioning ⟶ $(i \bmod 5) + 1$.

Ans.