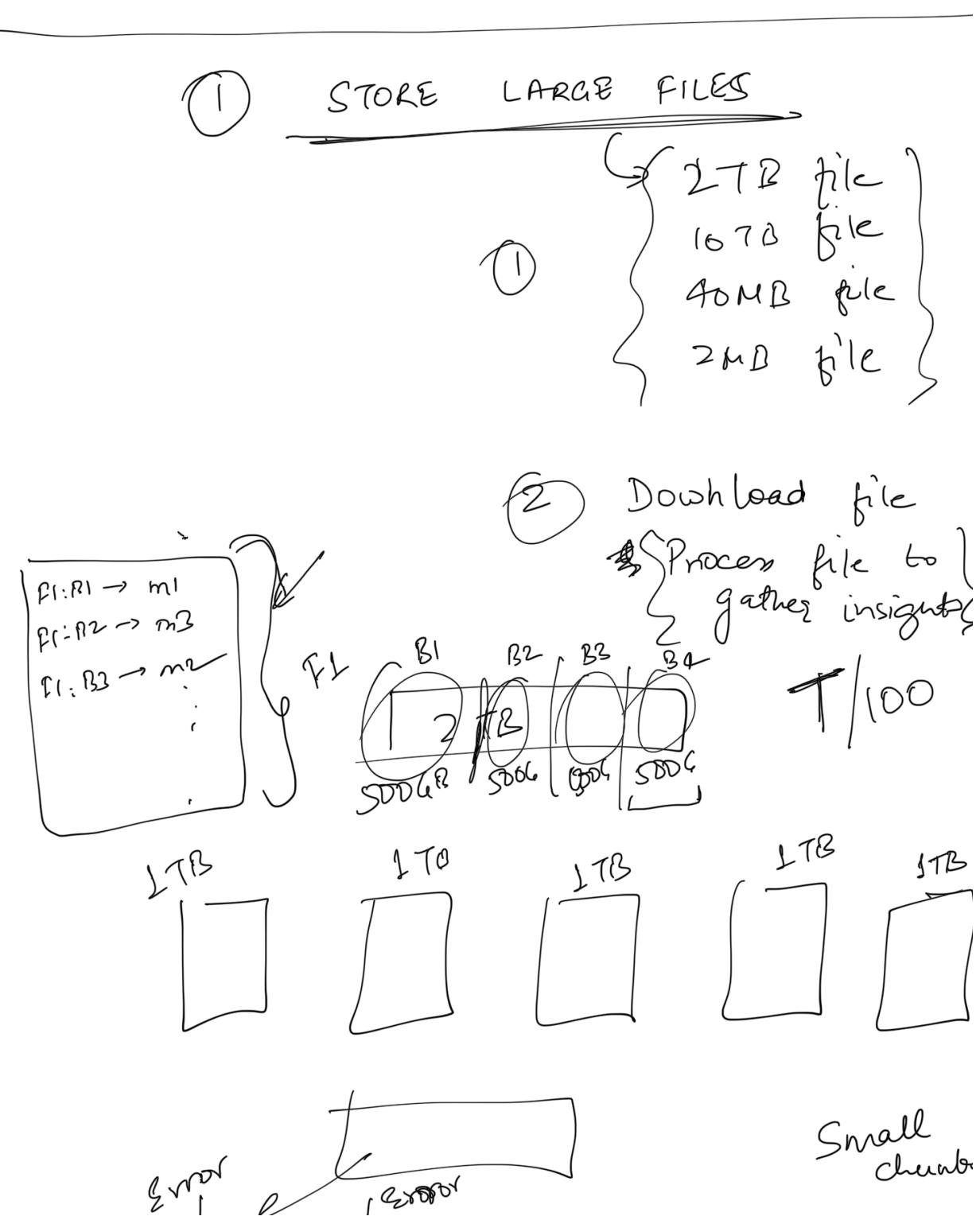
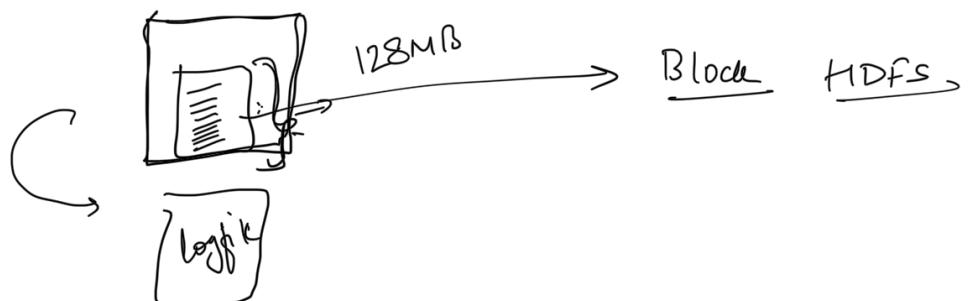
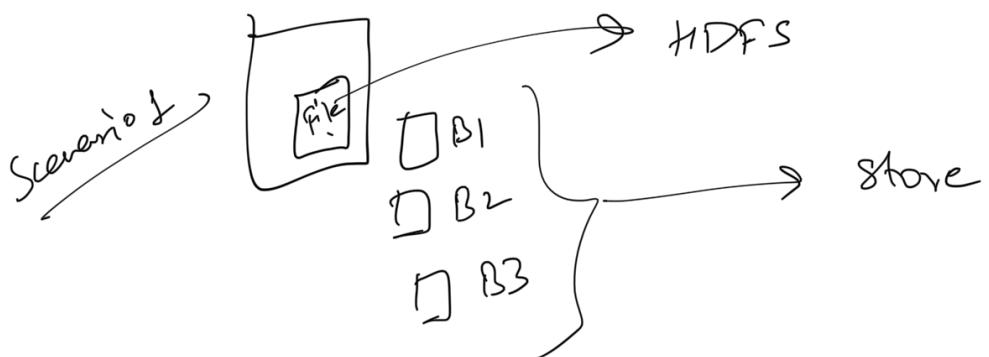
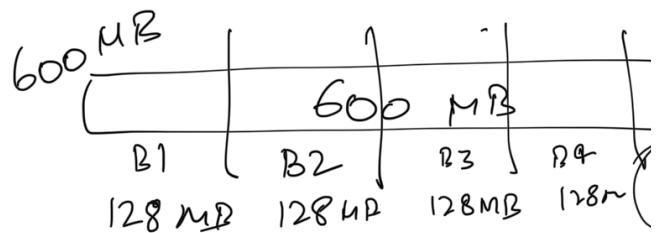
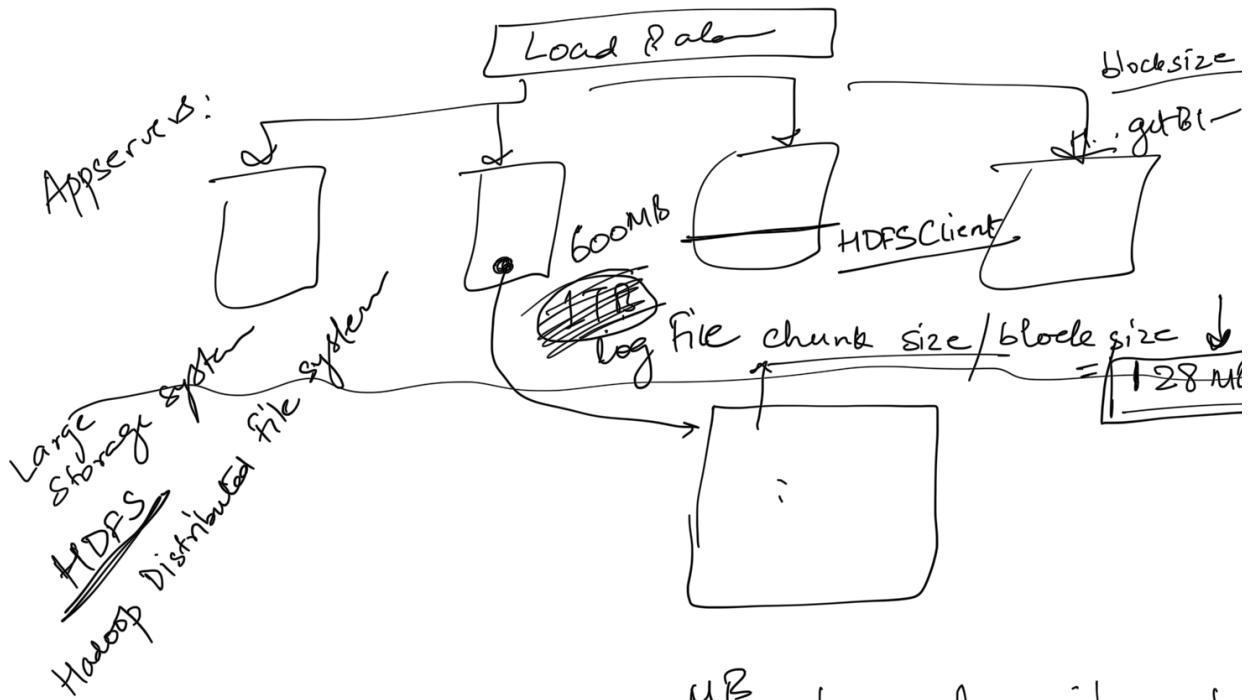
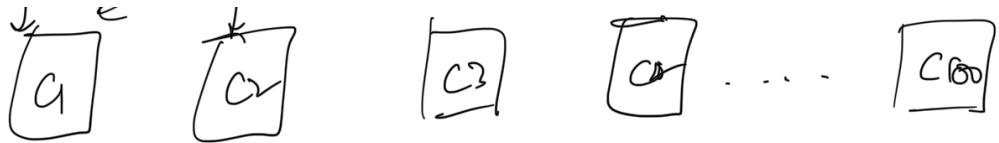
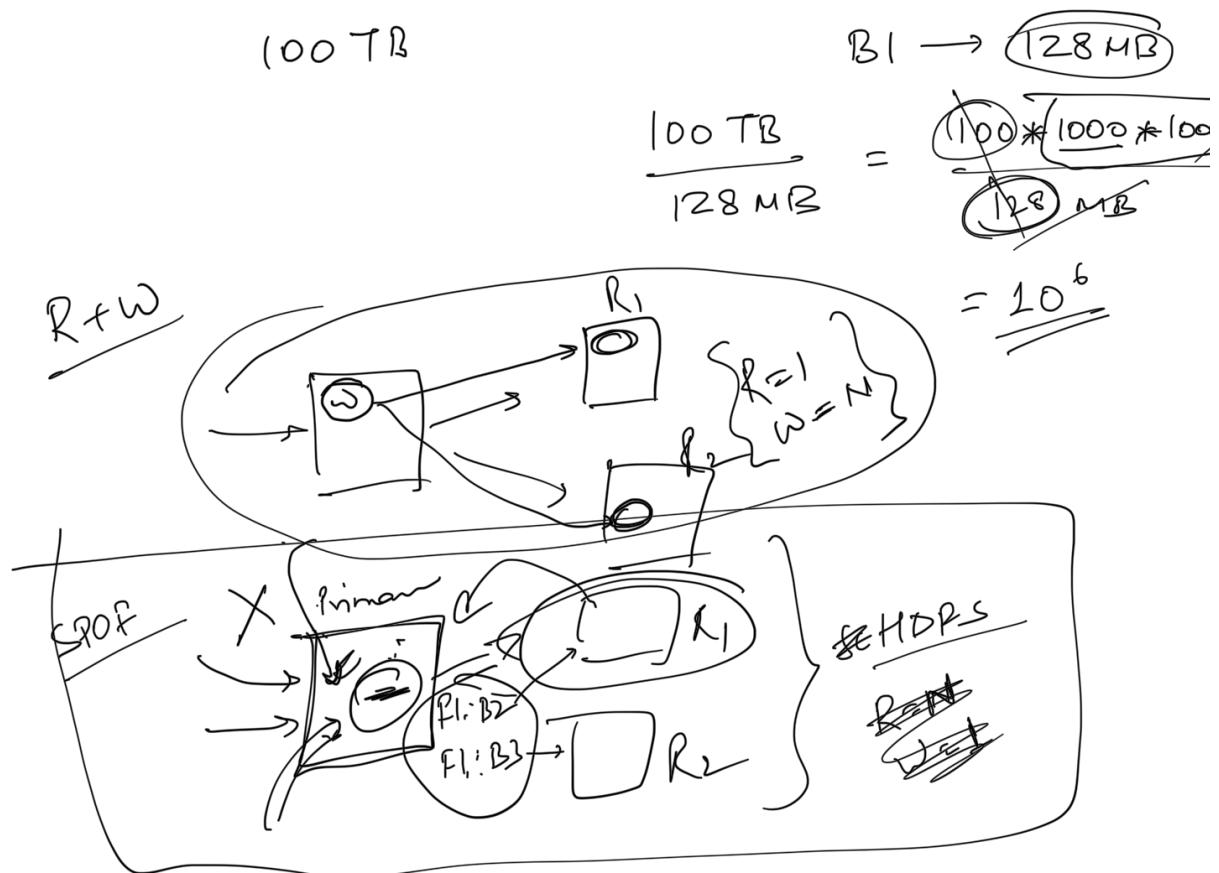
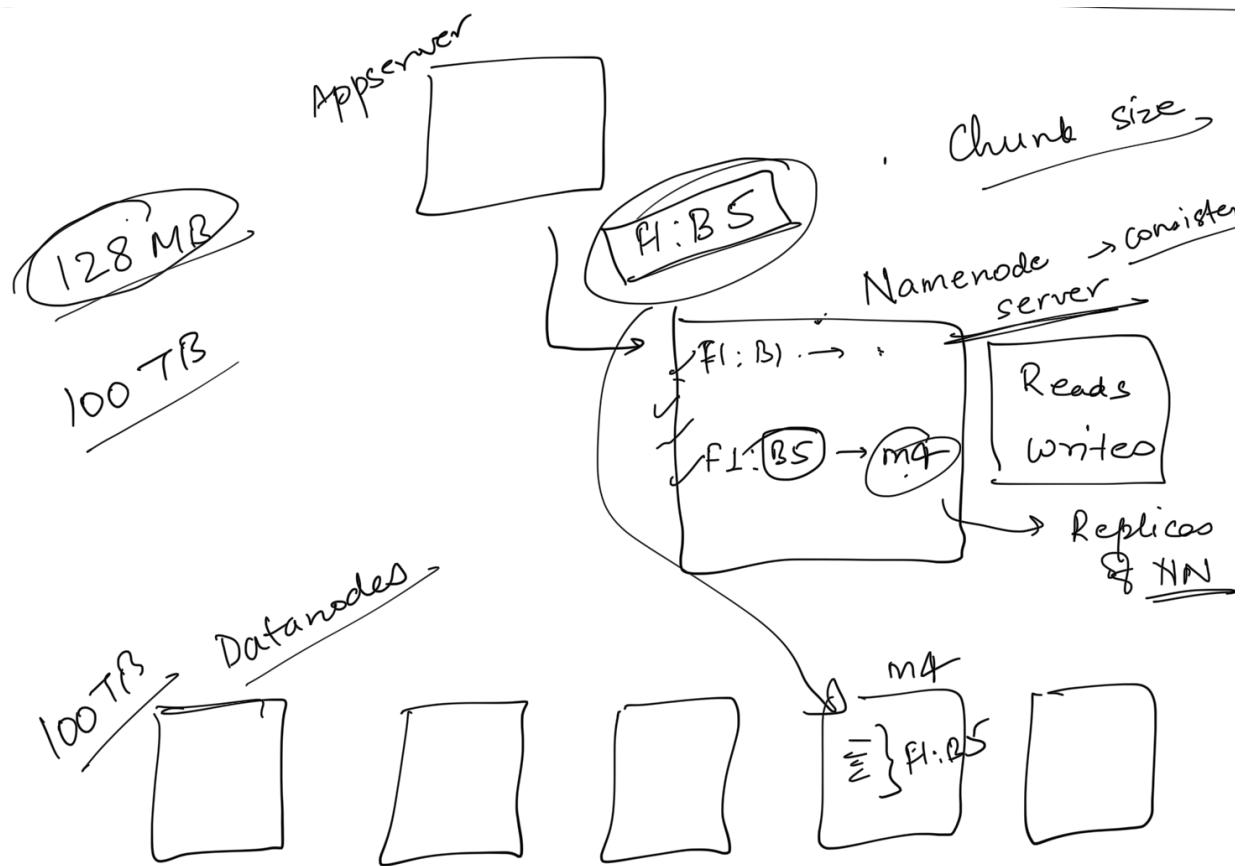


SYSTEM DESIGN

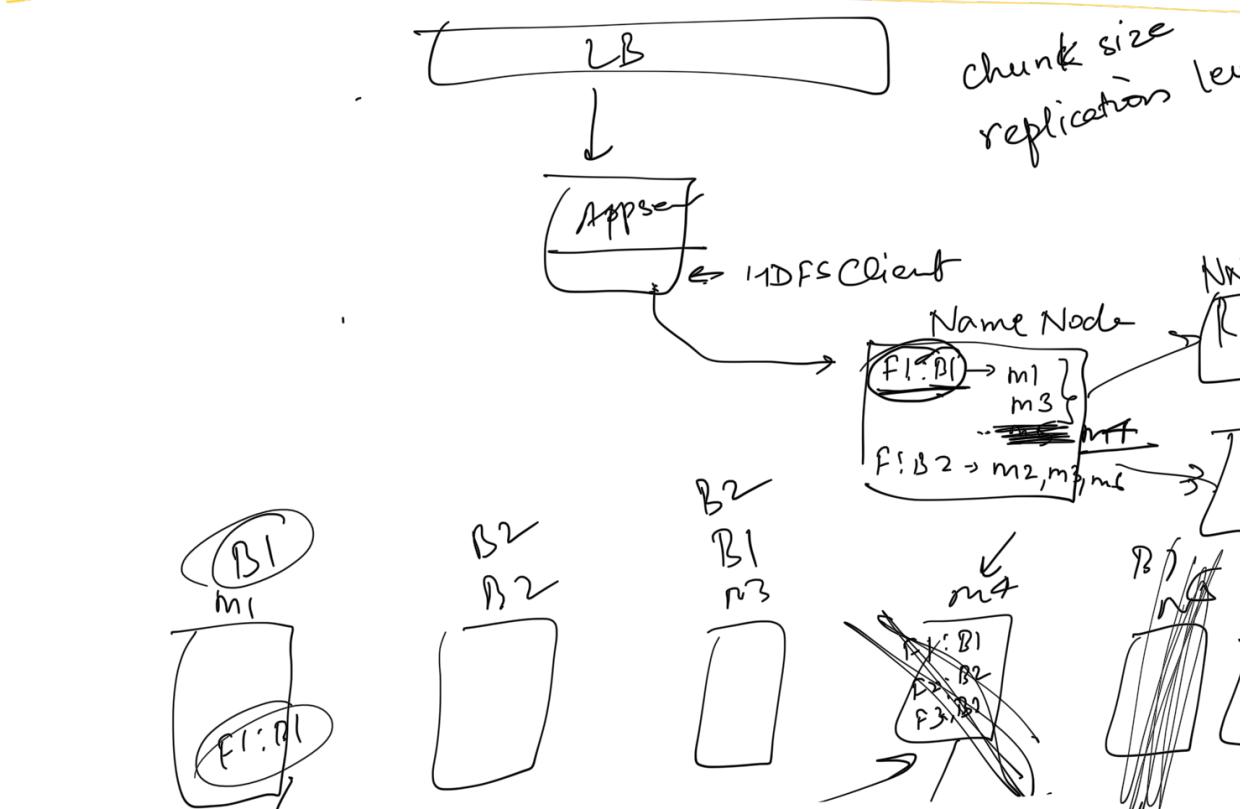
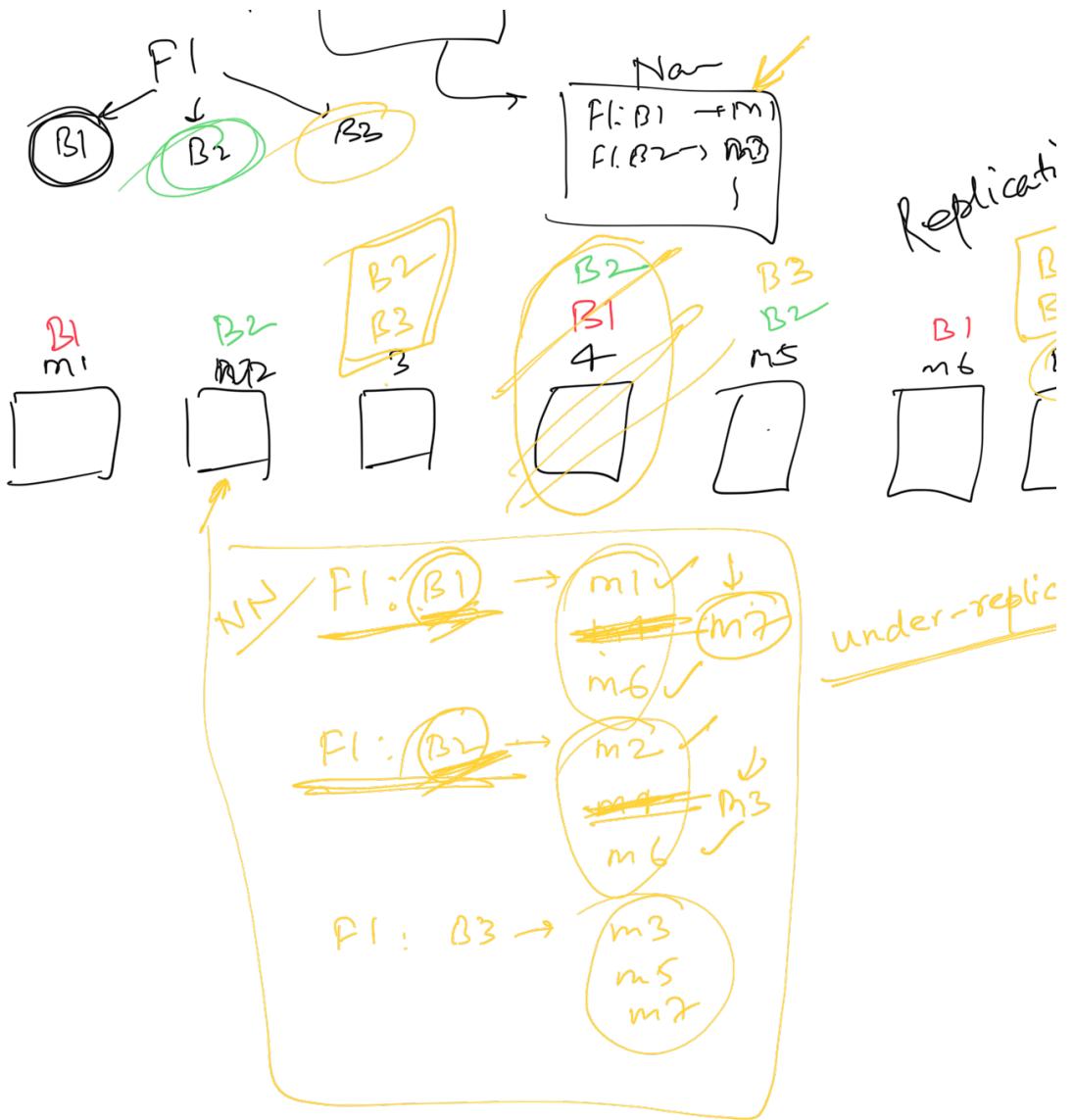
- ① LARGE STORAGE
 - ② PLACES — NEAREST NEIGHBORS -

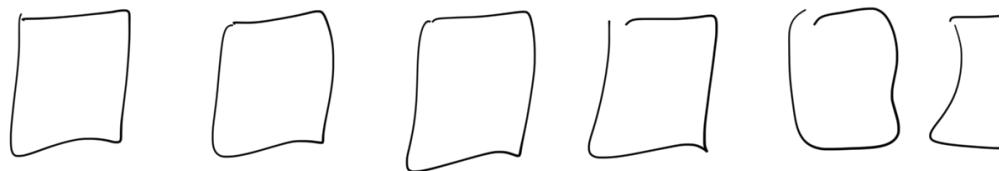
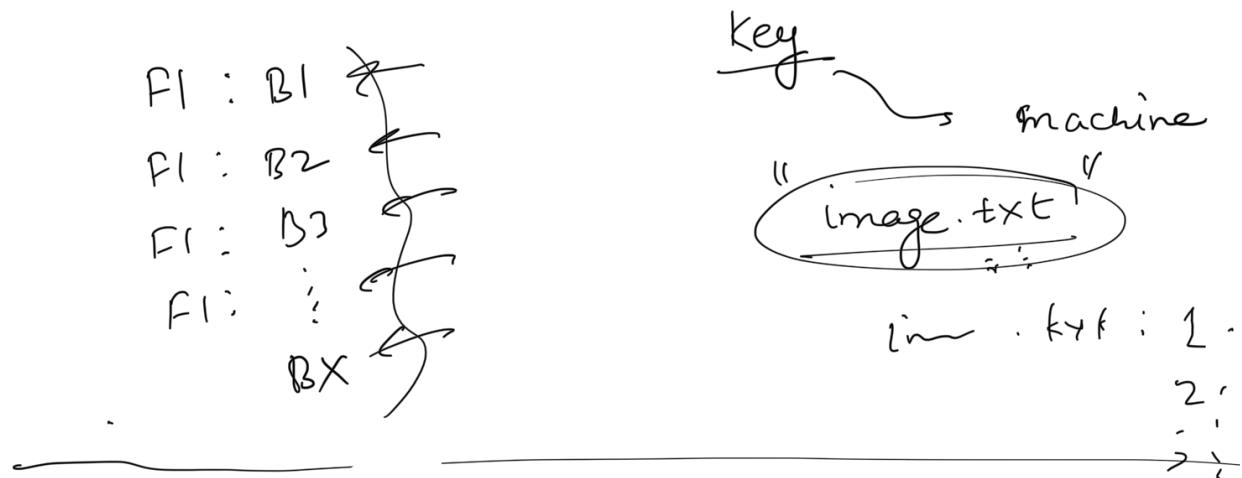
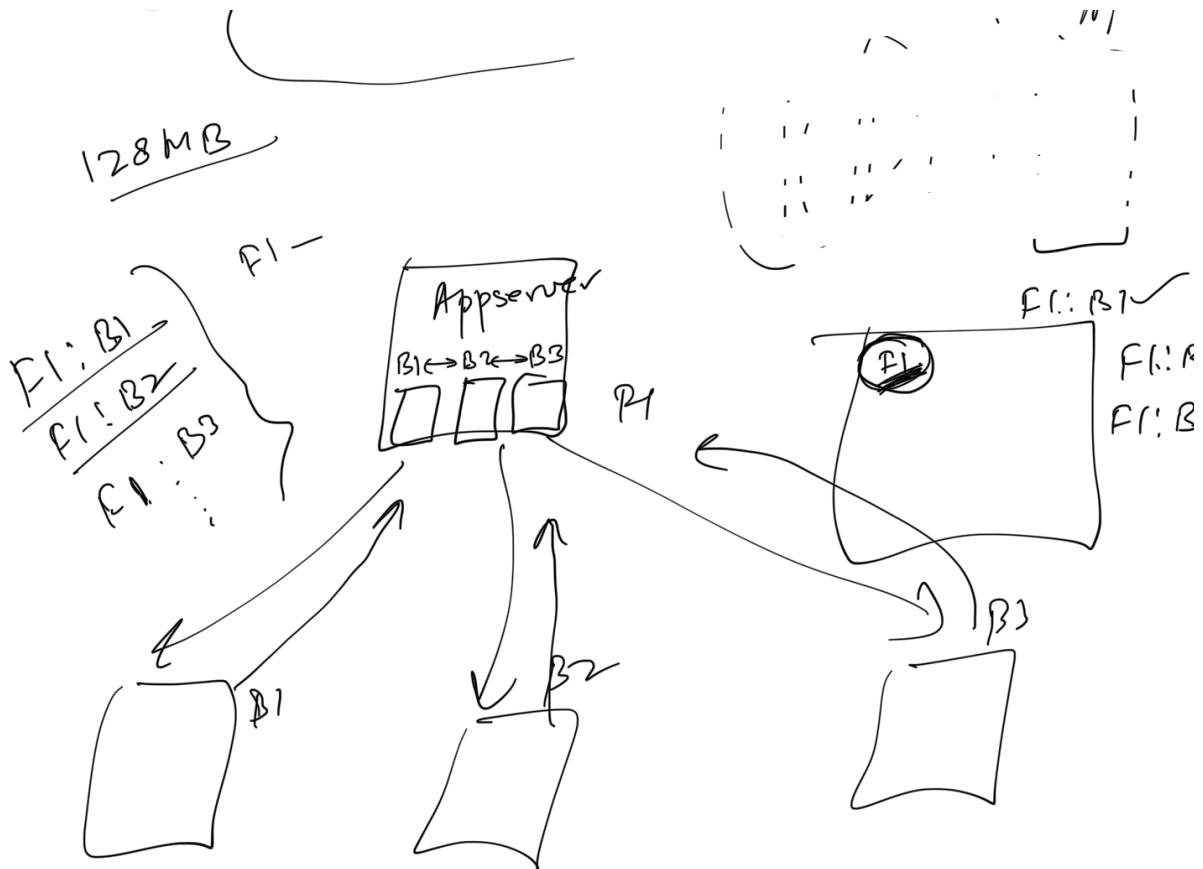






XS []



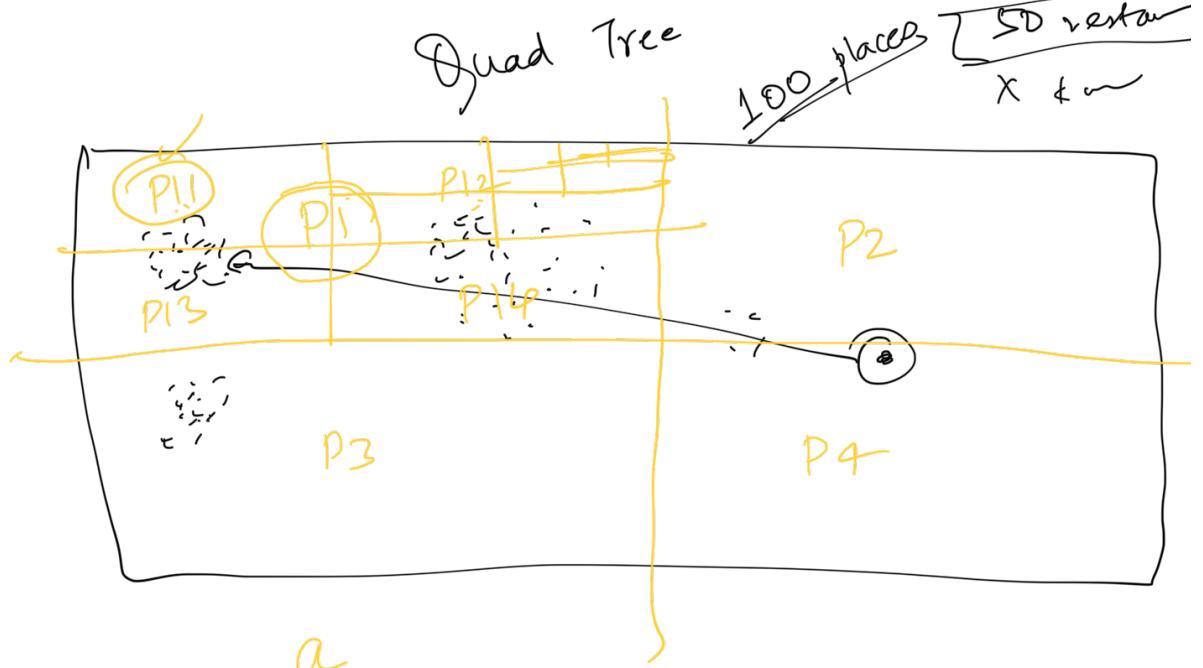


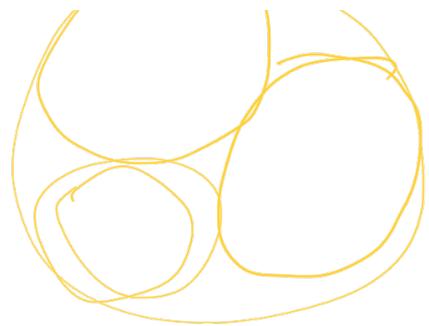
Stick figure (latitude, longitude)

$\left\{ \begin{array}{l} \text{lat} - 2, \text{lat} + 2 \\ \text{lon} - 2, \text{lon} + 2 \end{array} \right\}$

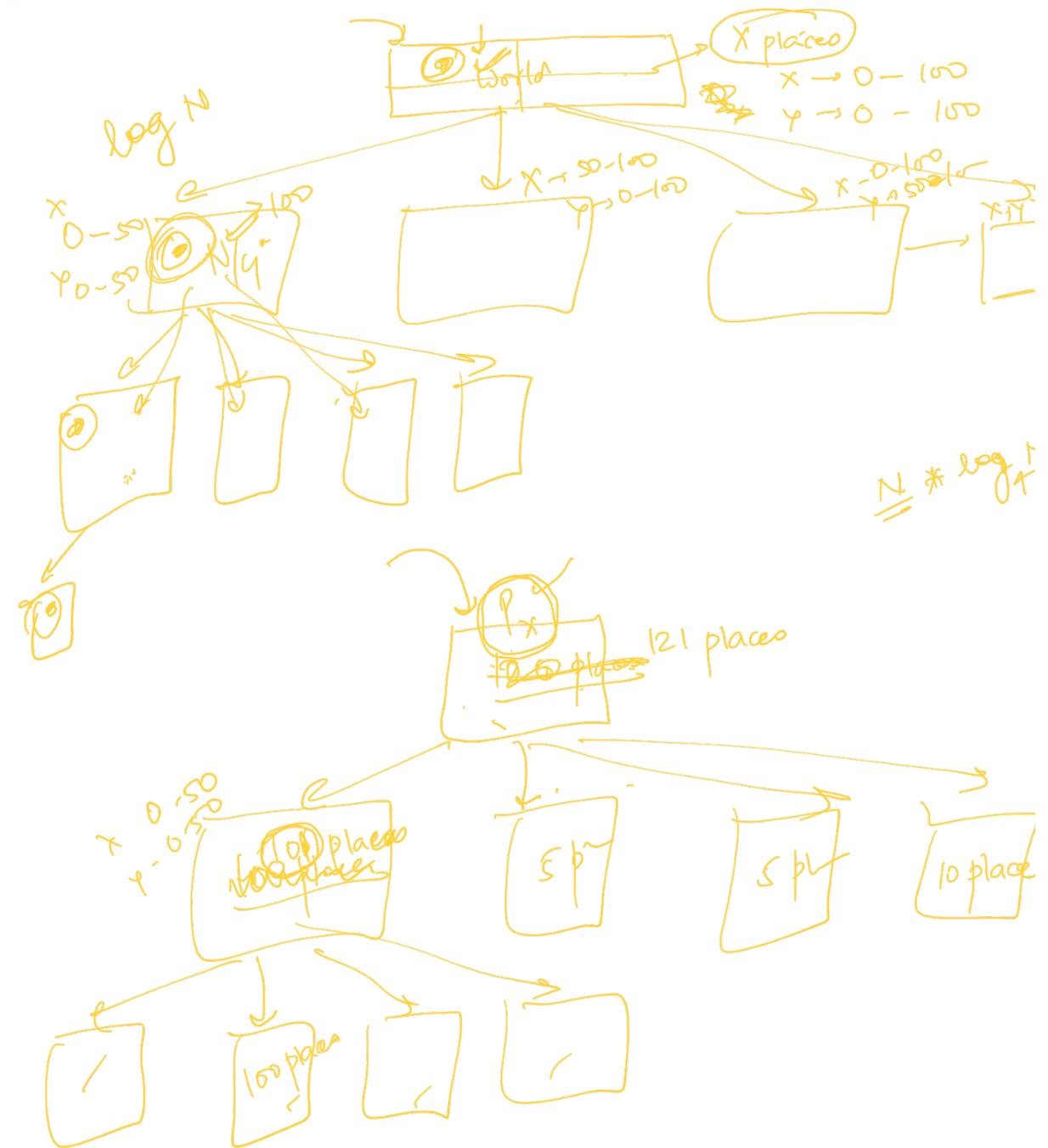
- ① Large DB of all restaurants
- ② Restaurants could be added / deleted
- ③ Queries

↳ (lat, long)
↓

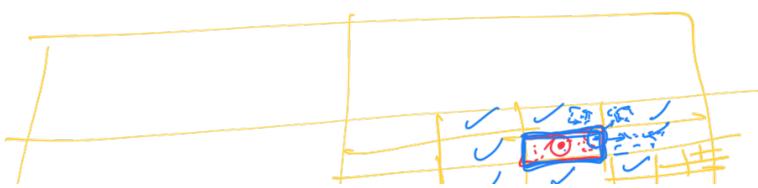


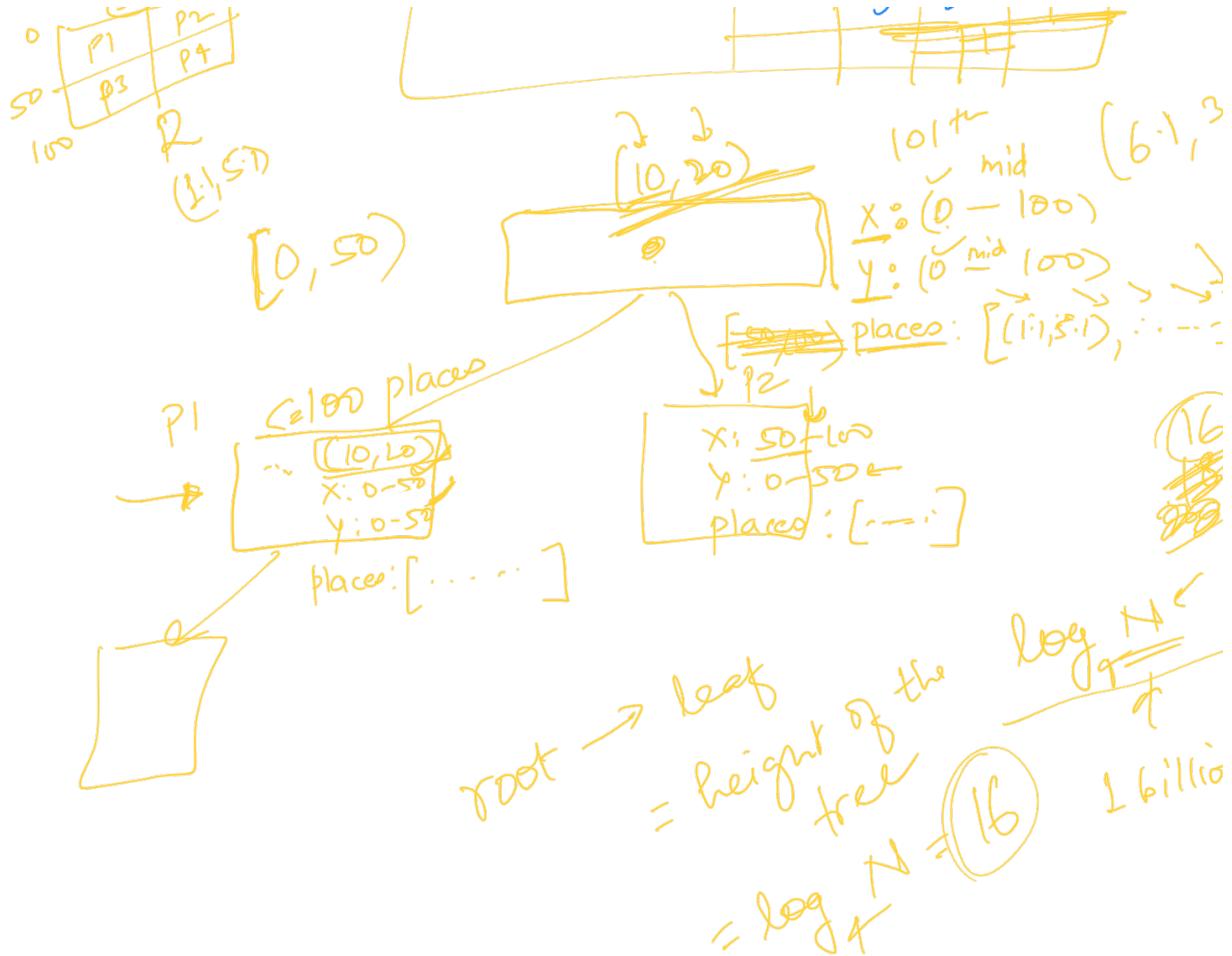


$X > 100$

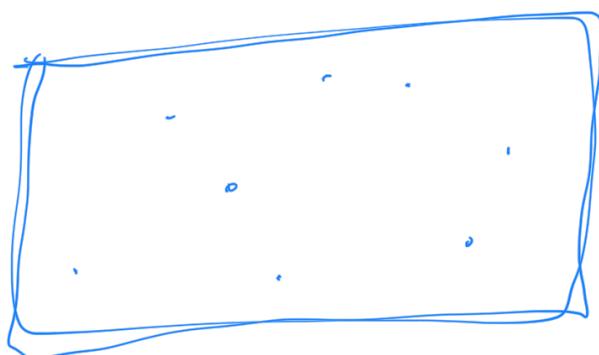
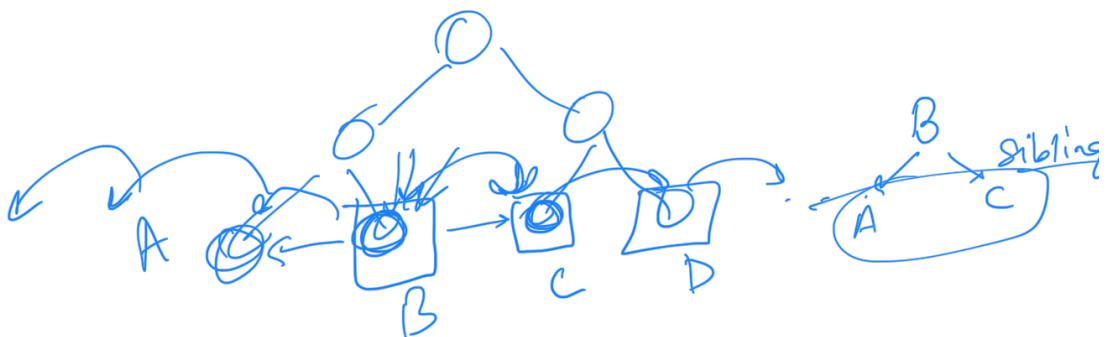


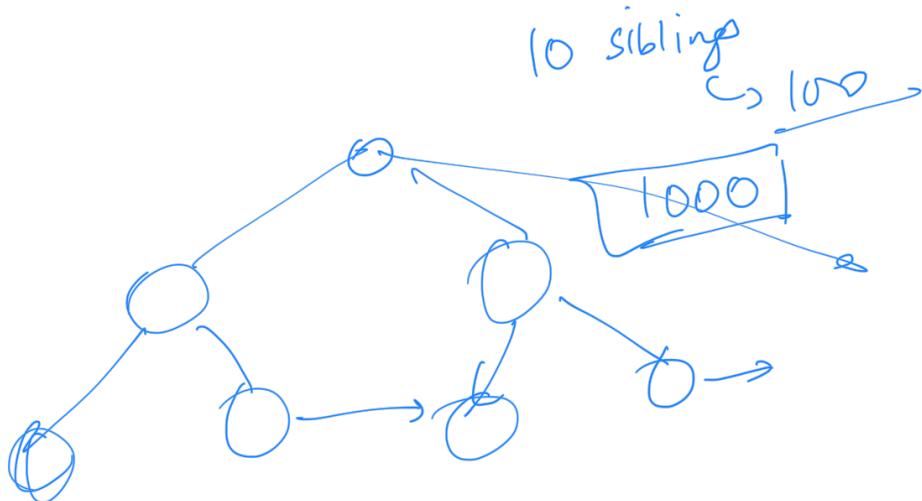
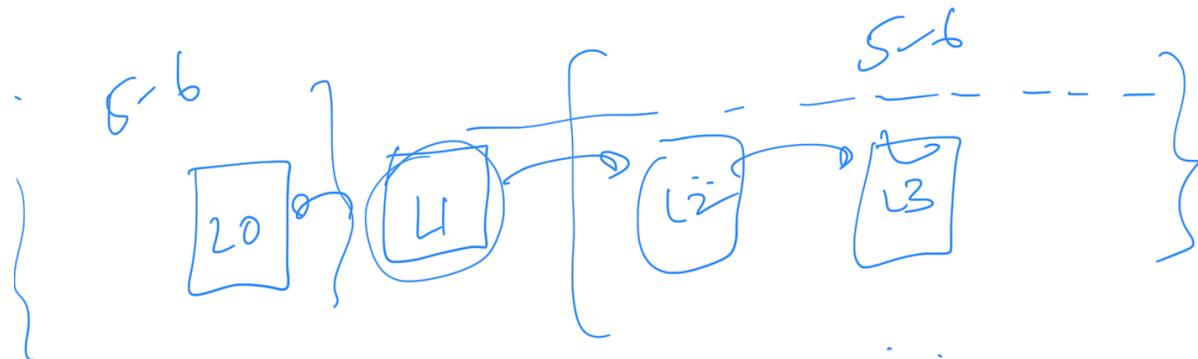
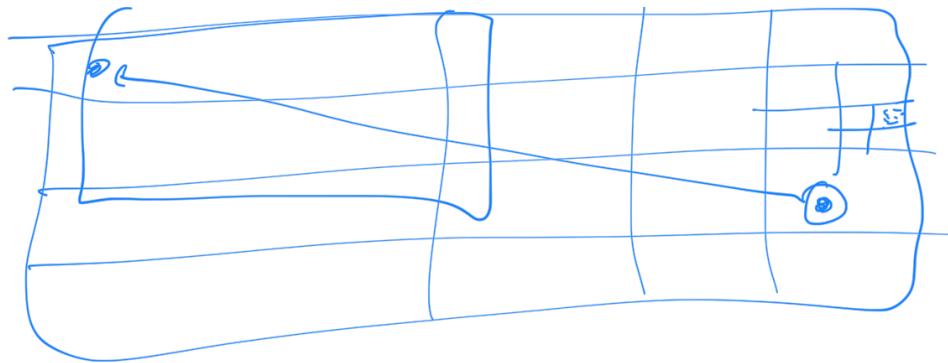
50 → 100





Candidate set #1 : (All points in
 current leaf node)



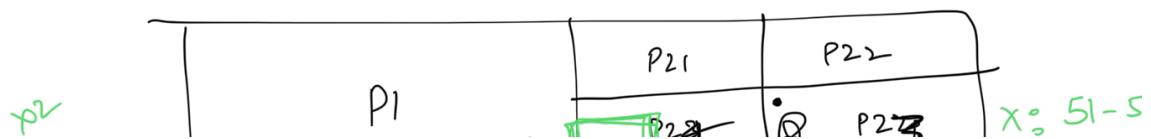


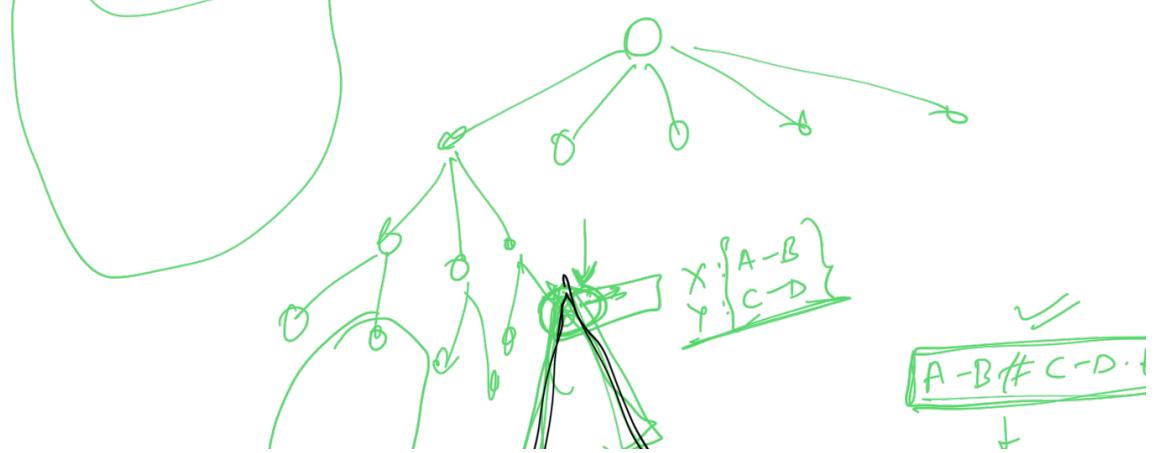
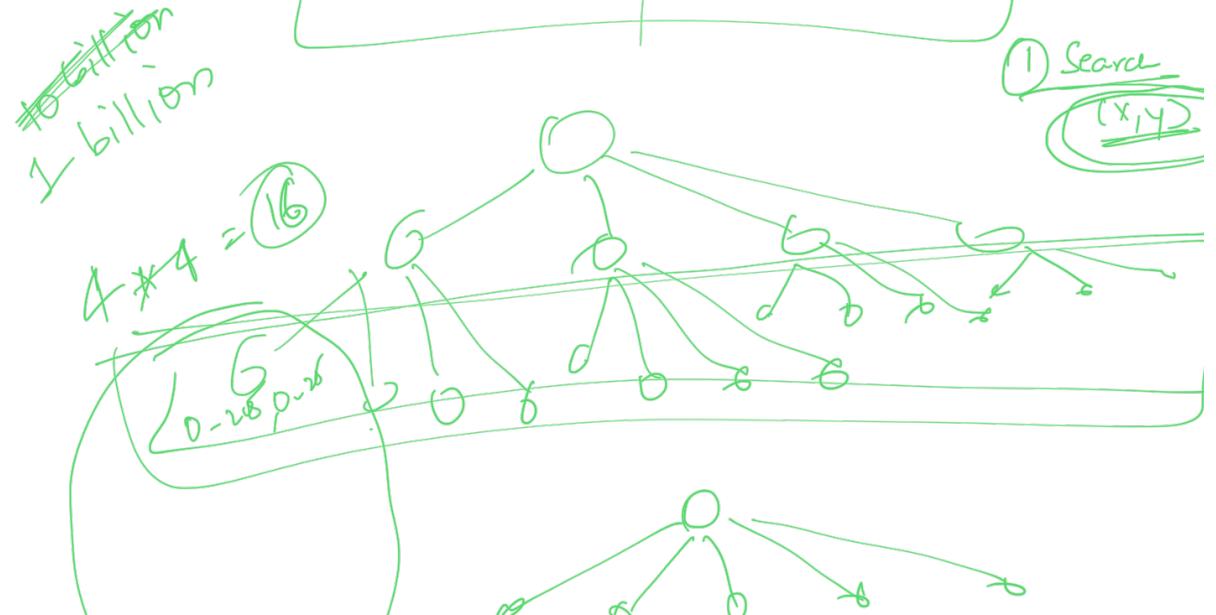
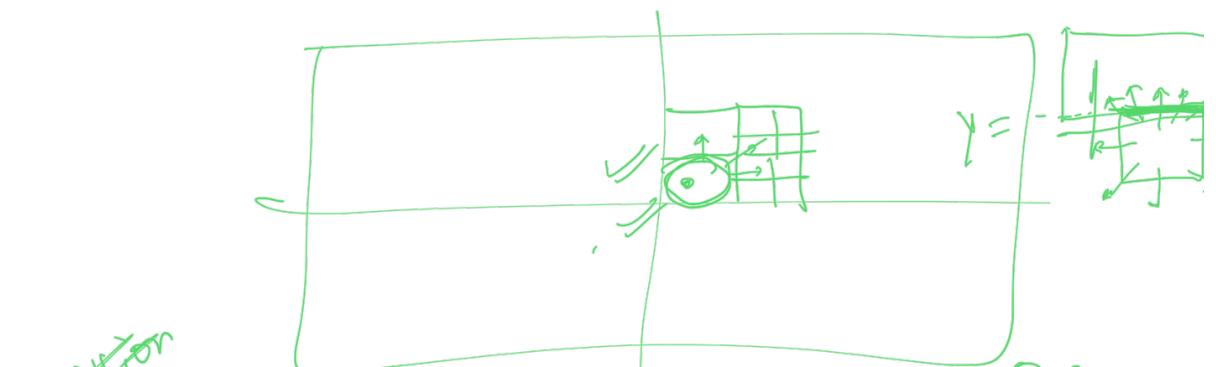
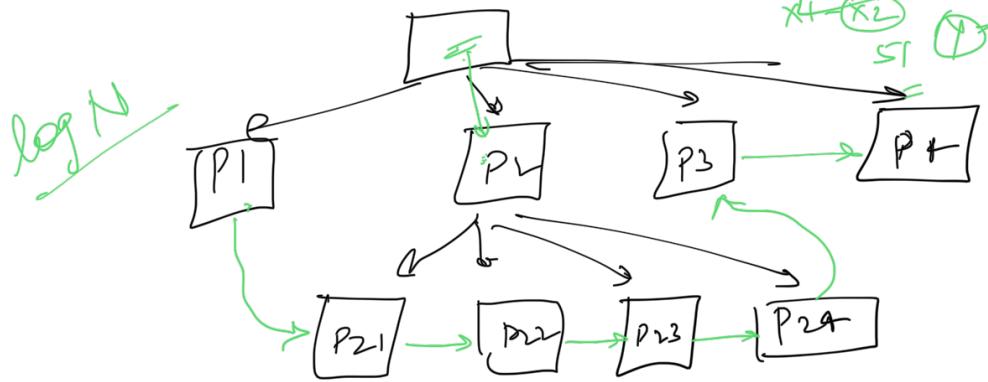
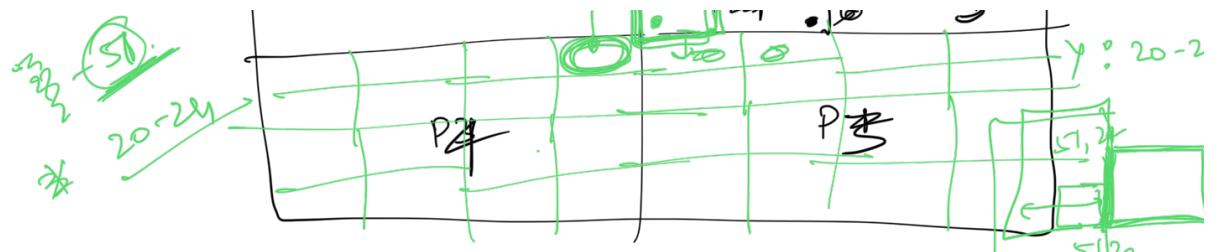
Cost of inserting new restaurant : $\log N$

cost of deleting rest : $\log N$

Cost of finding 50 neighbors :

$$\cancel{\log N} + \text{loop}$$





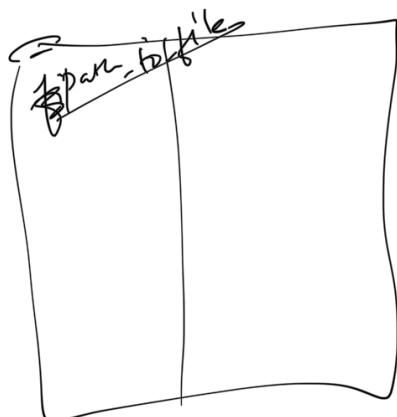
$$X = \{A-B, C-D\}$$

$$\overline{A-B+C-D}$$



 ↗ SDMP

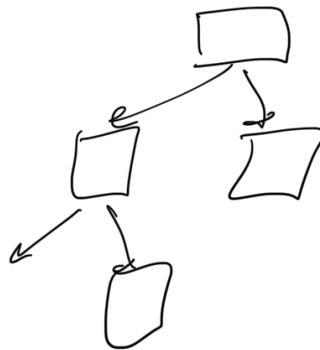
loc MP



$\lceil \text{opt} / \log \rceil \approx \text{cd} \cdot \log$

Hashmap
 $\{ \text{key} \rightarrow \text{value} \}$

let # long → seek loc from HD



$\left\{ \begin{array}{l} X \rightarrow \underline{\underline{20 - 30}} \\ Y \rightarrow \underline{\underline{40 - 50}} \end{array} \right.$

