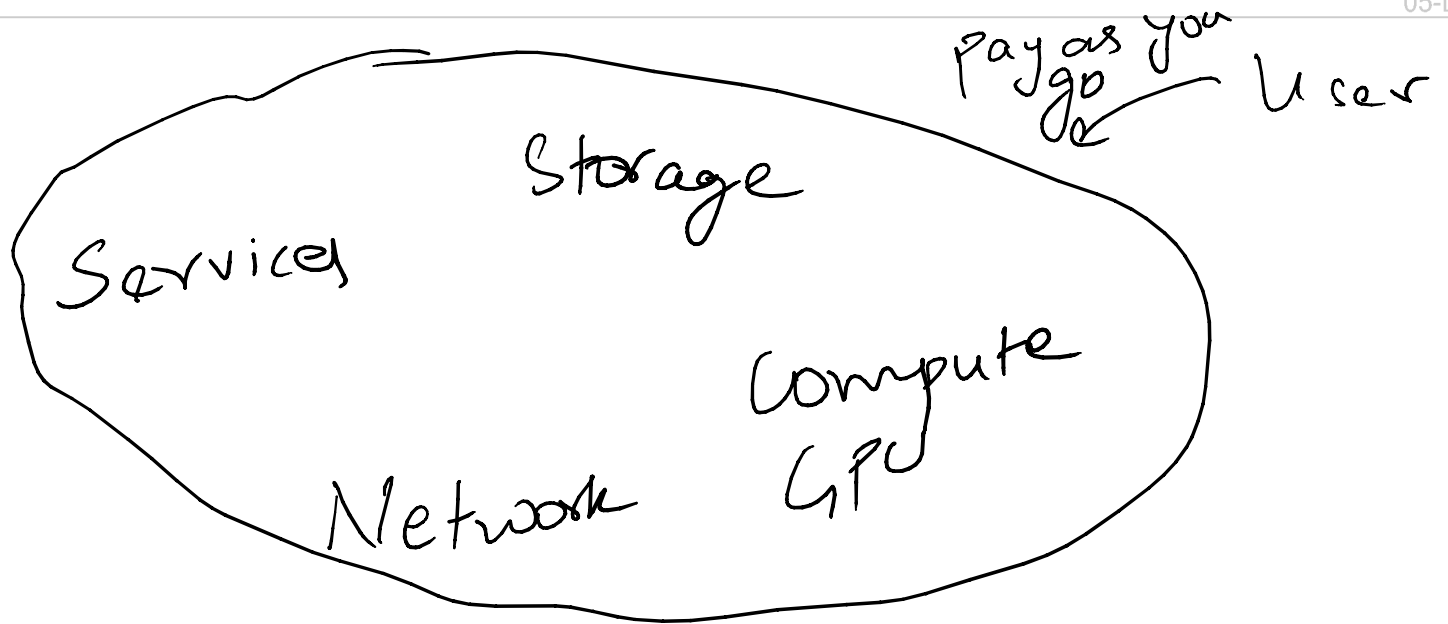


# Cloud

# Abhilash

Note Title

05-Dec-22



~ 1800 days  
~ ↑ days

- manage faults
- Downtime is expensive
- Elasticity
- Proximity

- Virtualization ←

- Computation

- Storage

Overprovisioning



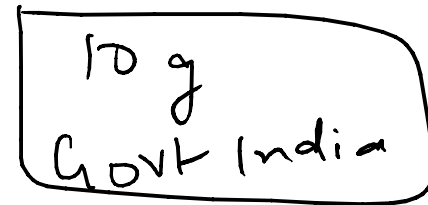
100 kg  
→



20 yrs  
→ Sell

management

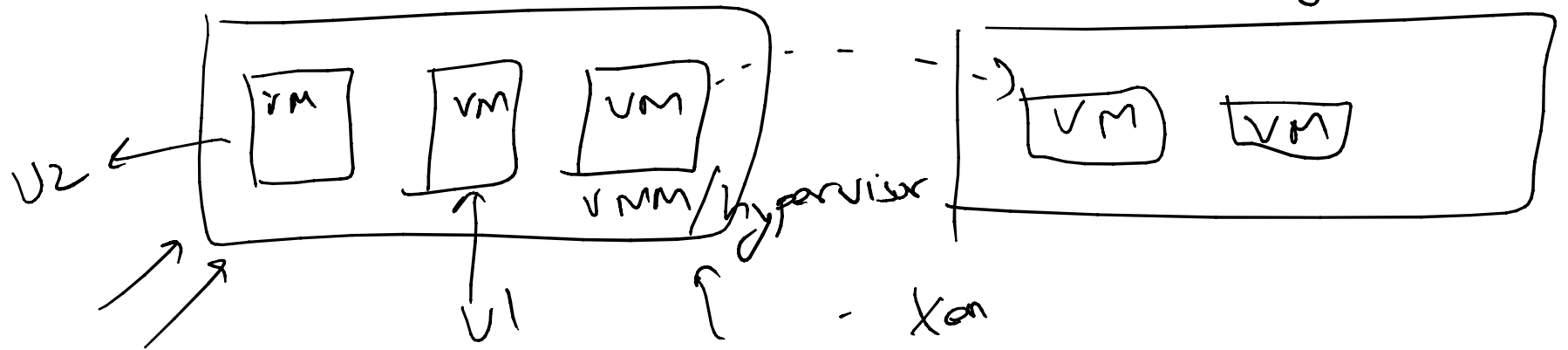
virtual gold: Gold bars



Amazon, Google

Isolation

Load balancing



- Xen
- KVM/QEMU
- Firecracker

## Computation

- Data does not fit in memory  $\leftrightarrow$
- Not enough CPU/GPU  $\leftrightarrow$  Runtime

$\rightarrow$  Scalability

FT

Stragglers mitigation

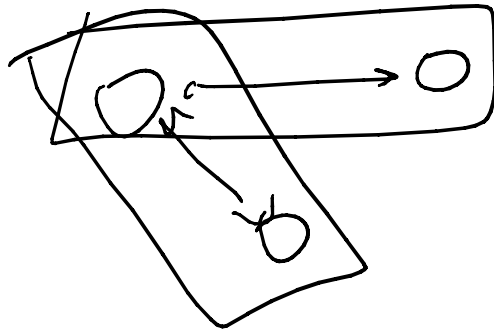
Ease of programming

Correctness

## Scalability

Basic ops take constant time "+", "x", "=="  
memory access is free

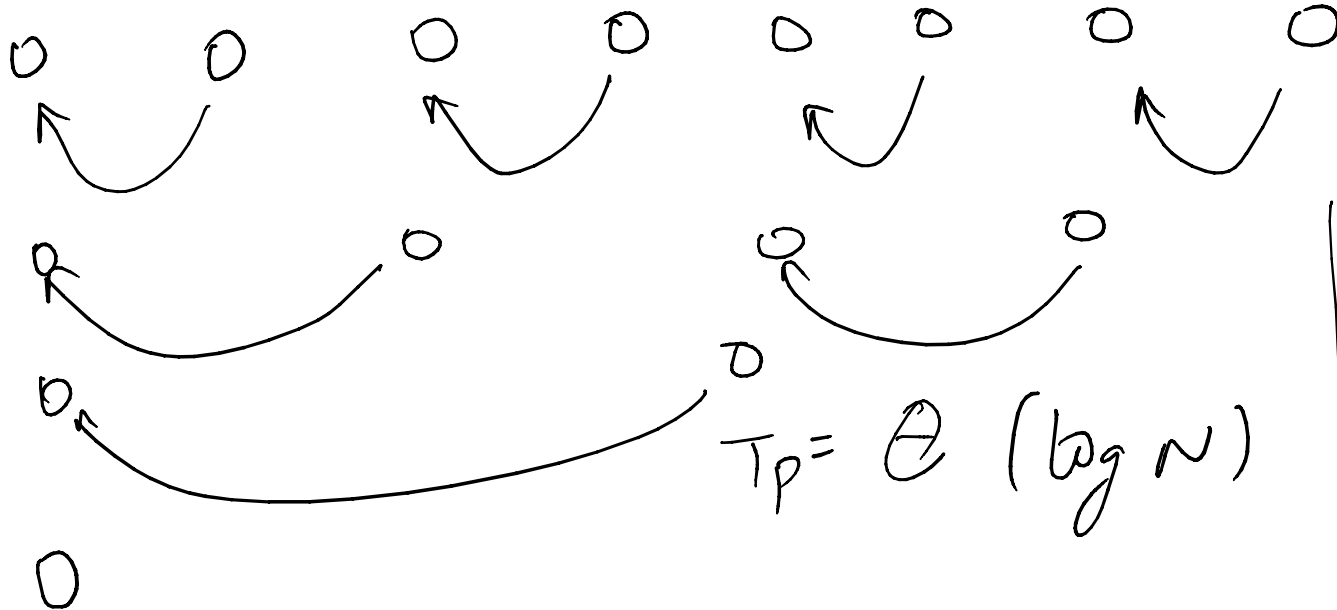
Communication is constant time  $t_c$



Adding  $N$  numbers

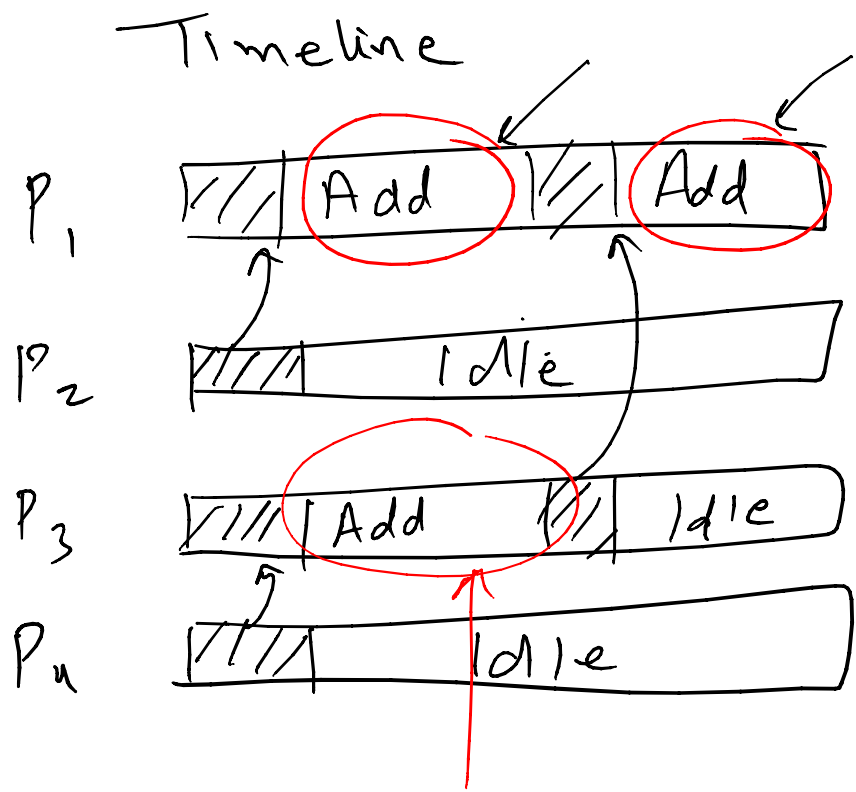
$$T_s = \Theta(N)$$

$\log N$



$$T_P = \Theta(\log N)$$

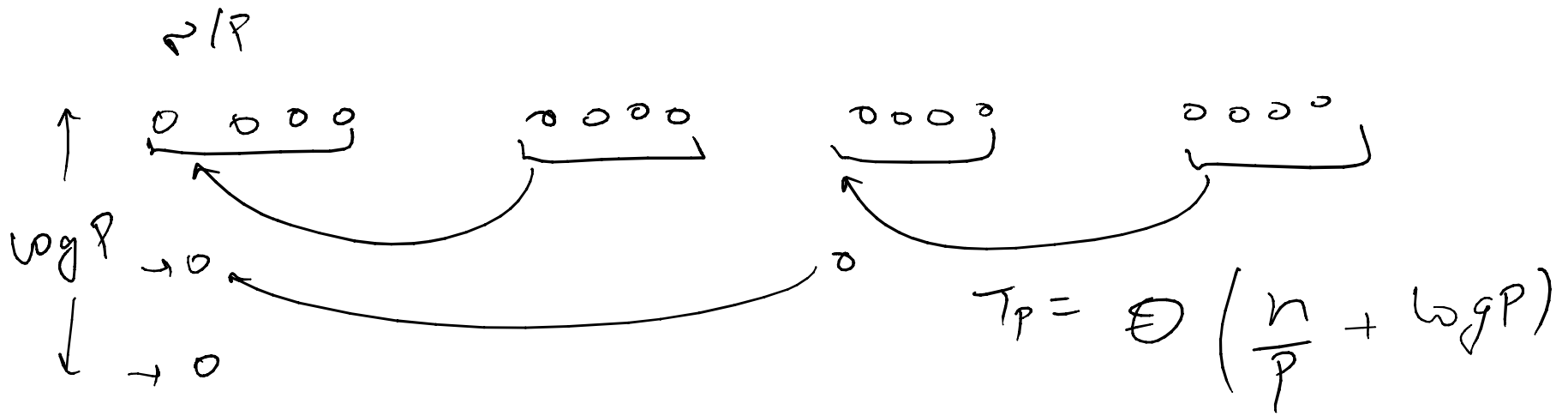
$$S = \frac{T_s}{T_P} = \frac{N}{\log N} \approx N$$



$$E = S/p = \left( \frac{N}{\log N} \right) / N$$

$$0 < E < 1 = 1 / \log N$$





$$S = \frac{N}{\frac{N}{P} + \log P} = \frac{P}{1 + \frac{P \log P}{N}}$$

$$E = \frac{1}{\left(1 + \frac{P \log P}{N}\right)}$$

$$\epsilon = \frac{1}{1 + \frac{p \log p}{N}}$$

$$w: N \sim \Theta(p \log p)$$

$$w_1: \Theta(p \log p)$$

$$w_2: \Theta(p)$$

