Notes:

Aspects of CPU Performance (CPU Law)

$$\text{CPU time} = \frac{\text{Seconds}}{\text{Program}} = \frac{\text{Instructions}}{\text{Program}} \times \frac{\text{Cycles}}{\text{Instruction}} \times \frac{\text{Seconds}}{\text{Cycle}}$$

	Inst Count	CPI	Clock Rate
Program	X		
Compiler	X	(X)	
Inst. Set.	X	X	
Organization		X	X
Technology			X

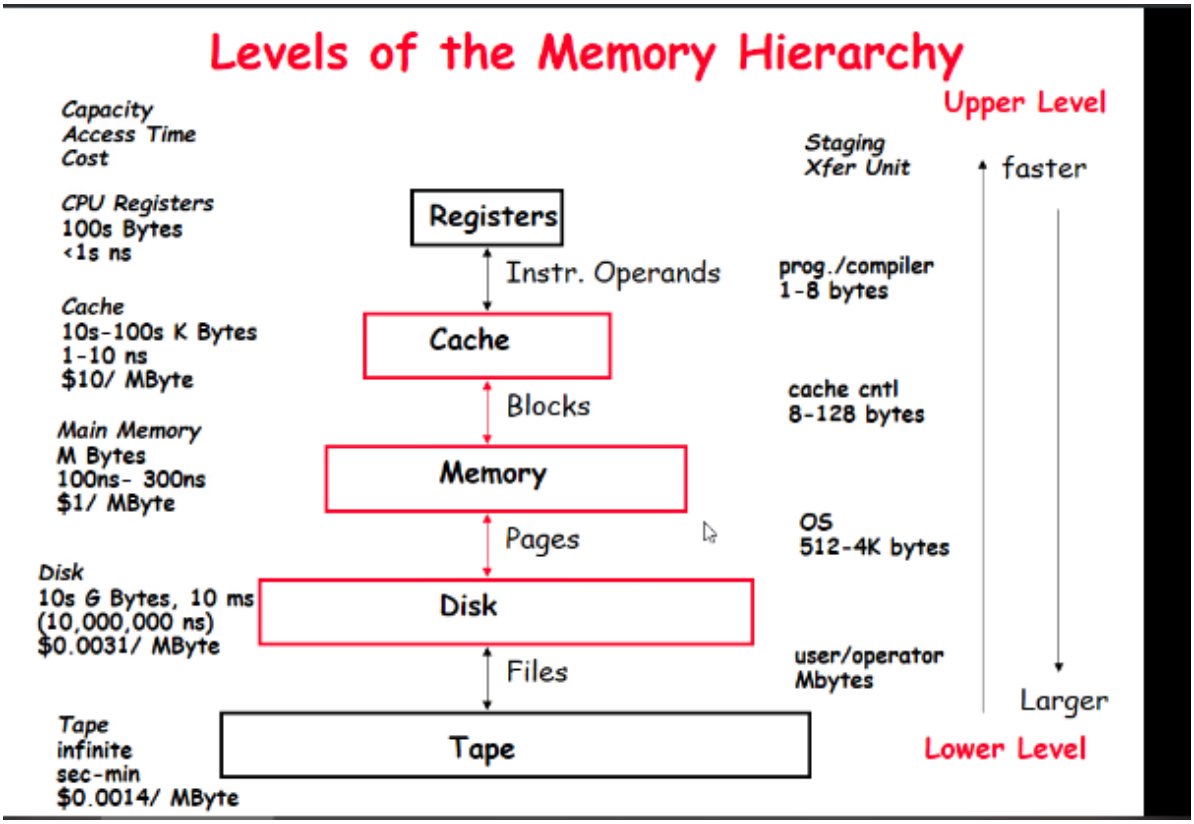
how can we improve CPU performance

- RISC has lower CPI than CISC.
- Organization: Booth's Multiplier, Carrier Look Ahead. If made small and simple, clock rate can be decreased.

1965, IBM360

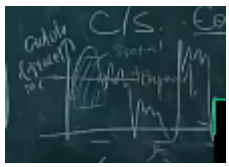
Amdahl "Arch of IBM 360"

$Sp = \frac{Told}{Tnew} = \frac{(1-\eta)+\eta}{(1-\eta)+\frac{\eta}{S}}$, η is the most common part.



memory hierarchy

- Cache

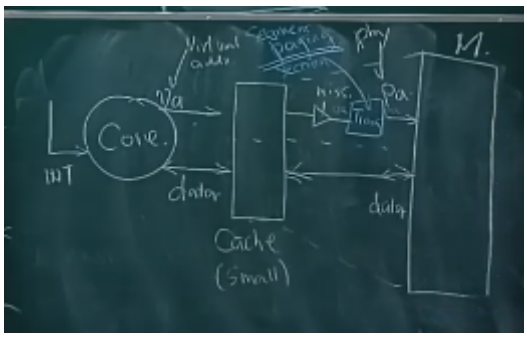


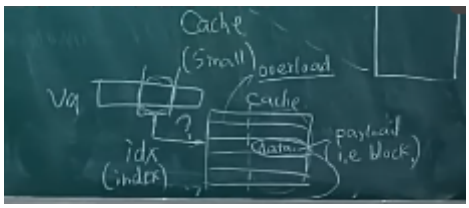
addr-time

If an address is visited, then addresses next to it and itself will be visited at high probability

$AMAT_{cache} = T_{hit} + \eta_{missrate} \times T_{penalty}$

$AMAT$ means average mem access time.





$Va \rightarrow idx$:DM(Direct Mapping), FA, SA(Set Associative)