Fundamental Operators

Let r and s be relations with schemas R and S

union	$r \cup s = \{\, t \mid t \in r \vee t \in s \,\}$
difference	$r - s = \{\, t \mid t \in r \wedge t \notin s \,\}$
cartesian_product	$r \times s = \{\, t \mid t = t_r\, t_s \text{ where } t_r \in r \wedge t_s \in s \,\}$
selection	$\sigma_P(r)$
projection	$\pi_A(r)$

The Memory Hierarchy

Example:
Intel PIII
CPU: 450MHz
Memory: 512MB

CPU Die

CPU

Registers

L1 Cache

40 ns

L2 Cache

90ns

Main Memory
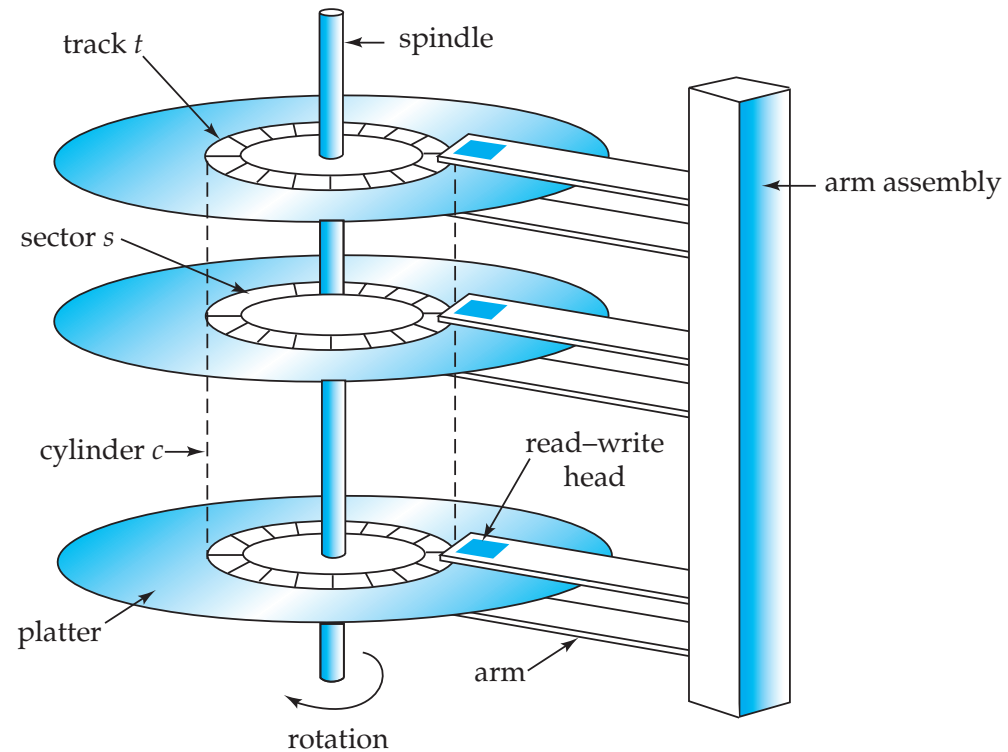
14 ms = 14000000 ns

Hard Disk
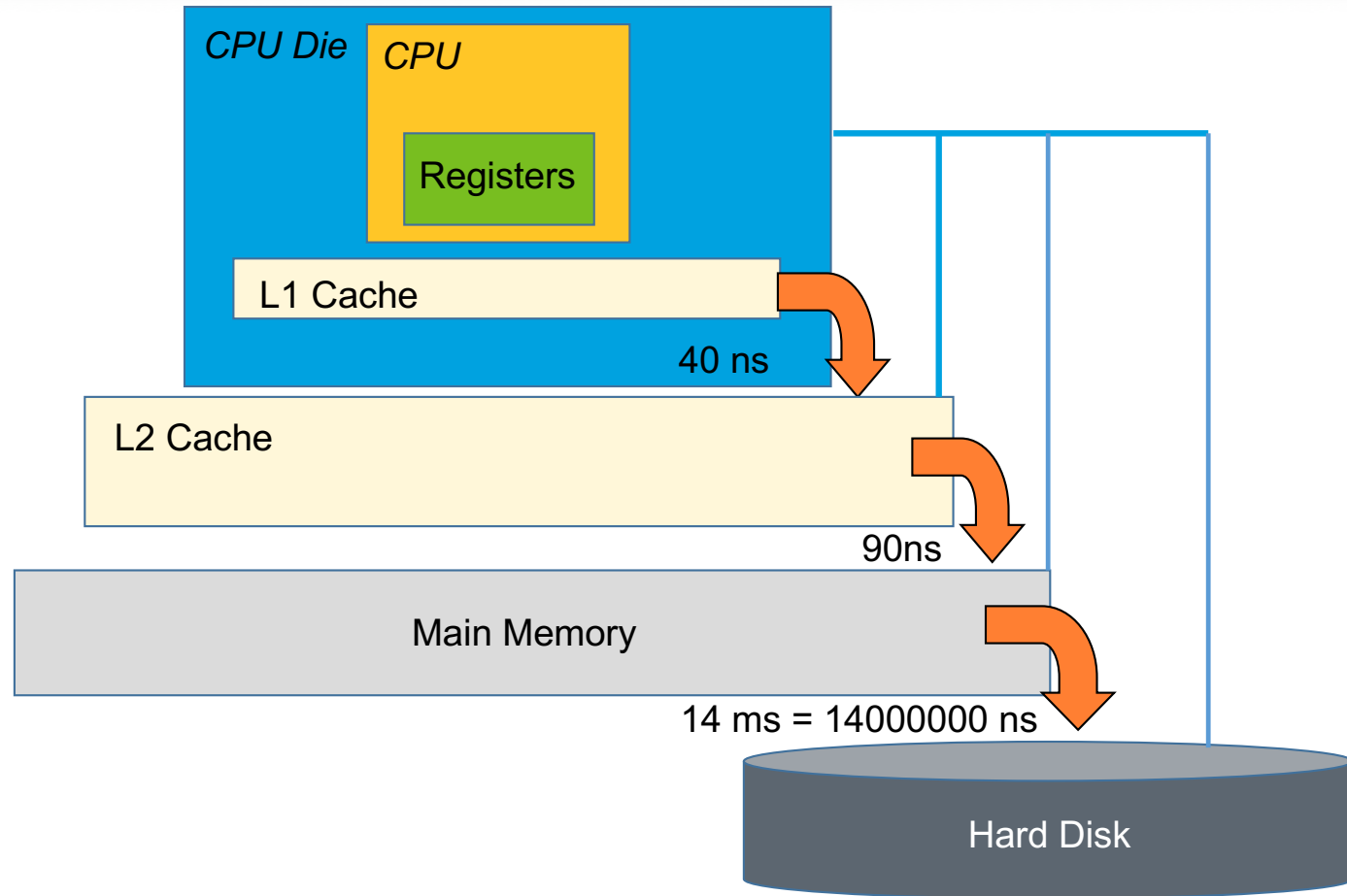
Internal Data Storage

Image source: https://www.snia.org

Clustered vs. Unclustered Index