

Homework 0: The Foster Method

Sunday, January 30, 2022 2:29 PM

Data: abcdefghbc dsb

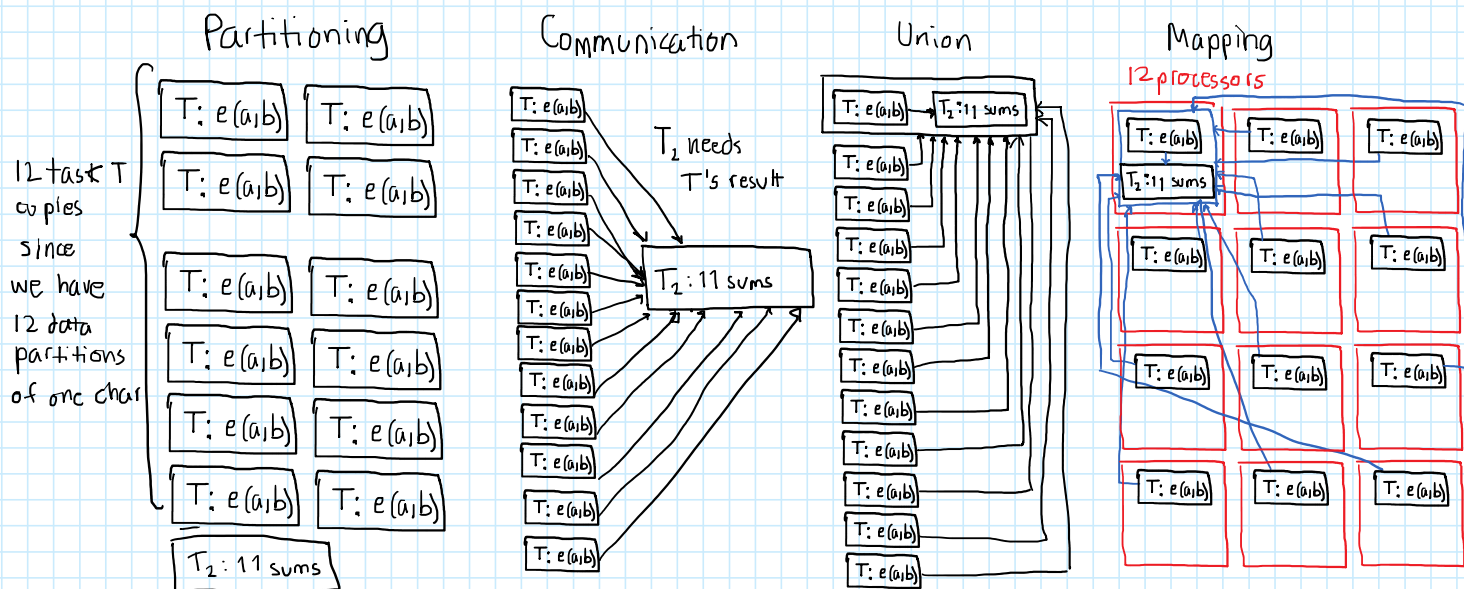
Task: count the number of "b" in the data.

↳ basic operation: equals(a,b) $\begin{cases} T & \text{if } a=b \\ F & \text{if } a \neq b \end{cases} \Rightarrow T: e(a,b)$

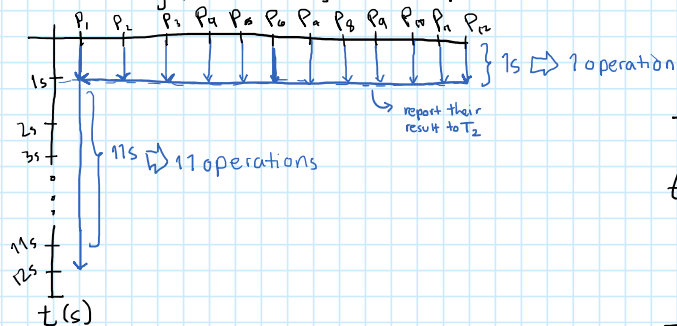
↳ counter: $C = \text{int}(r_1) + \text{int}(r_2) + \dots + \text{int}(r_{12}) \Rightarrow T_2: 11 \text{ sums}$
 $C = a + a + a + a + a + a$

① 12 processors, 1 data partition

Solution



Time diagram: Assuming that 1 operation ($=, +, -, *, /$) takes 1s:



$$t_{TOTAL} = \max\{P_1, P_2, P_3, \dots, P_{12}\}$$

$$t_{TOTAL} = \max\{12s, 1s, 1s, 1s, 1s, 1s, 1s, 1s, 1s, 1s, 1s, 1s\}$$

$$t_{TOTAL} = 12s$$

Ex 2

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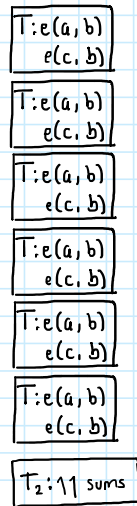
② 6 processors, data partition

Solution

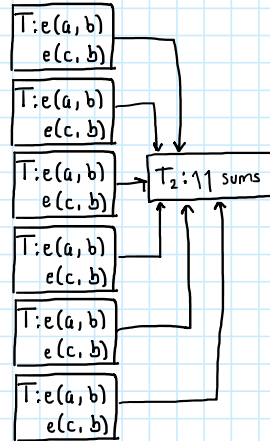
Data: abcfgvhbcdsb
 1 2 3 4 5 6 Parts → 6 processors

Task T has 2 basic operations

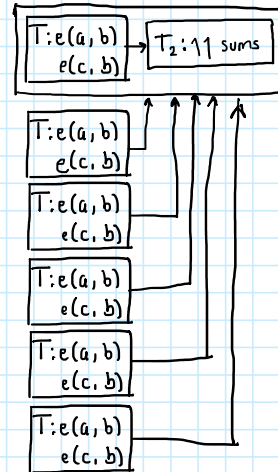
Partitioning



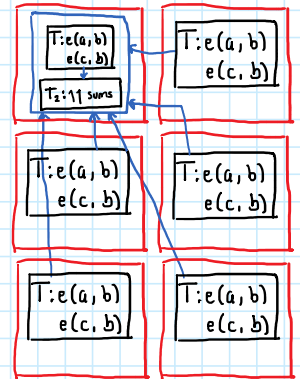
Communication



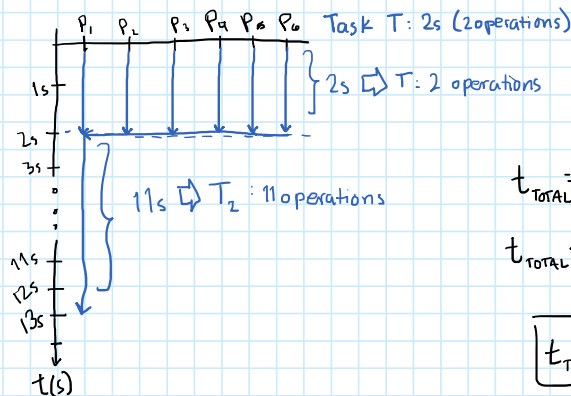
Union



Mapping



Time diagram: Assuming that 1 operation (=, +, -, *, /) takes 1s:



$$t_{\text{TOTAL}} = \max\{P_1, P_2, \dots, P_6\}$$

$$t_{\text{TOTAL}} = \max\{13s, 2s, 2s, 2s, 2s, 2s\}$$

$$t_{\text{TOTAL}} = 13s$$

Ex 3

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③ 3 processors, data partition

Data: abc fgv hbc dsb

Solution

3 processors \rightarrow 3 data partitions

abcf

gvhb

cdsb

$T: e(a,b)$
x4

Task T receives 4 letters

Task T does
4 basic
operations

Partitioning

Communication

Union

Mapping

$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T_2: 11 \text{ sums}$

$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T_2: 11 \text{ sums}$

$T: e(a,b)$
x4

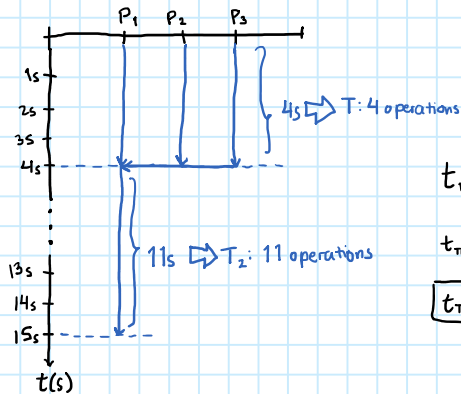
$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T: e(a,b)$
x4

$T: e(a,b)$
x4

Time diagram: Assuming that 1 operation ($=, +, -, *, /$) takes 1s:



$$t_{\text{TOTAL}} = \max\{P_1, P_2, P_3\}$$

$$t_{\text{TOTAL}} = \max\{15s, 4s, 4s\}$$

$$t_{\text{TOTAL}} = 15s$$

Ex 4

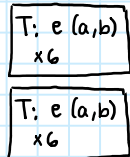
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④ 2 processors , data partition

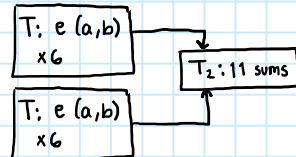
Data: a b c f g v h b c d s b
 1 2
 2 processors → 2 data partitions

T: e(a,b)
 x6
 Task T receives 6 letters (1 partition) } Task T does 6 basic operations

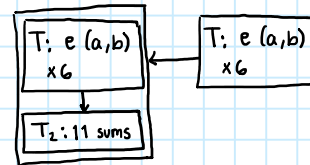
Partitioning



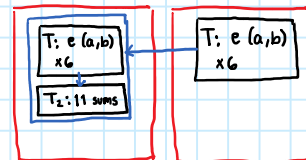
Communication



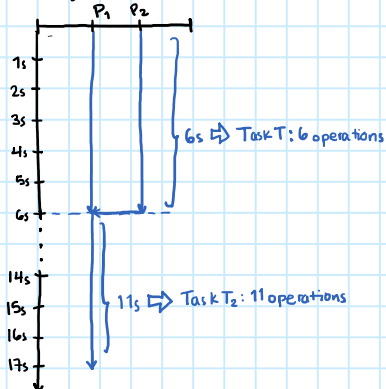
Union



Mapping



Time diagram: Assuming that 1 operation (==, +, -, *, \) takes 1s:



$$t_{TOTAL} = \max\{P_1, P_2\}$$

$$t_{TOTAL} = \max\{17s, 6s\}$$

$$t_{TOTAL} = 17s$$