Homework 0: The Foster Method

Sunday, January 30, 2022 2:29 PM

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Data: abcfgvhbcdsb

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

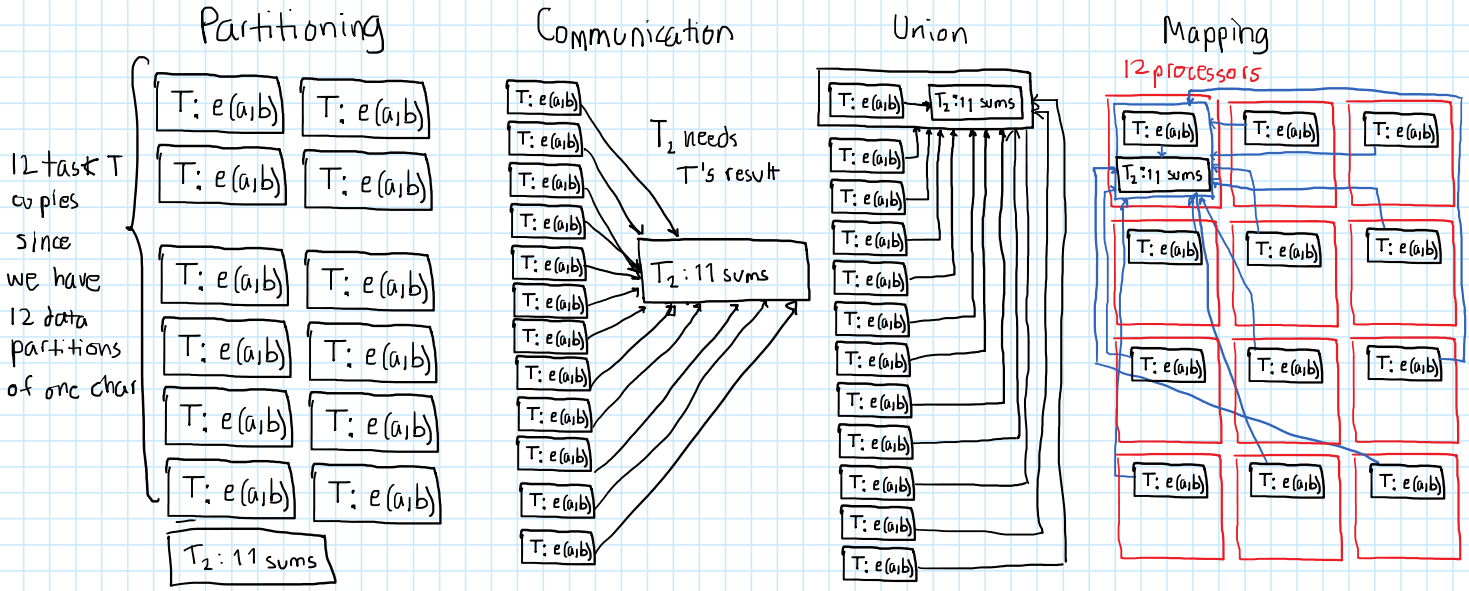
↳ basic operation: equals(a,b) { T if a=b, F if a!=b } ⇨ T: e(a,b)

↳ counter: c = int(r1) + int(r2) + ... int(r12) ⇨ T2: 11 sums

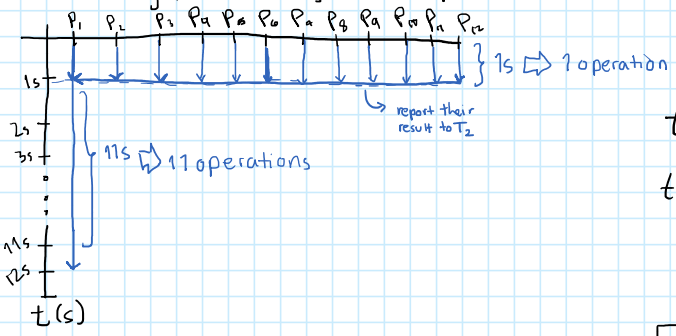
Assuming int(equals(a,b)) outputs 0 or 1.

(1) 12 processors, data partition

Solution



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



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

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

$t_{TOTAL} = 12s$

Ex 2

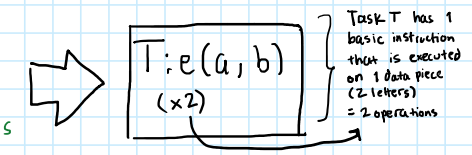
Sunday, January 30, 2022 9:41 AM

(2) 6 processors, 1 data partition

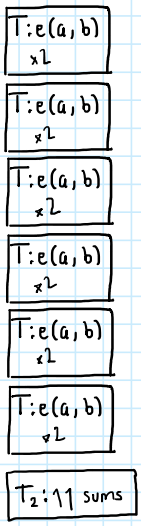
Solution

Data: abc fgv hbc dsb

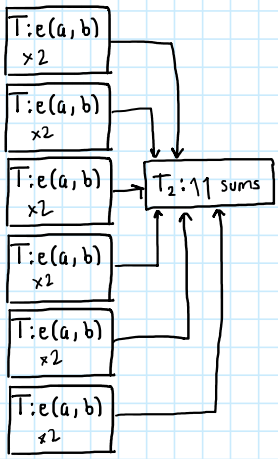
1 2 3 4 5 6 Parts → 6 processors



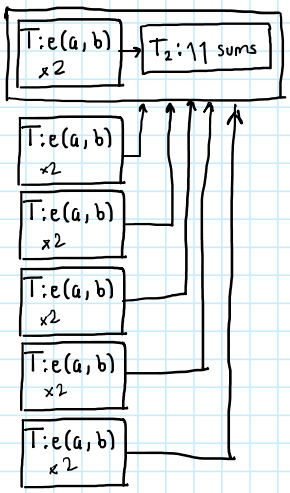
Partitioning



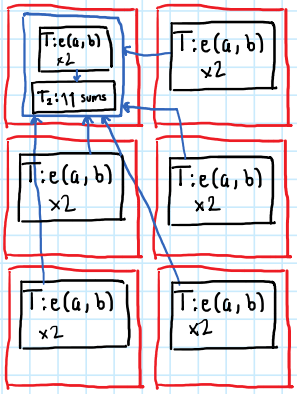
Communication



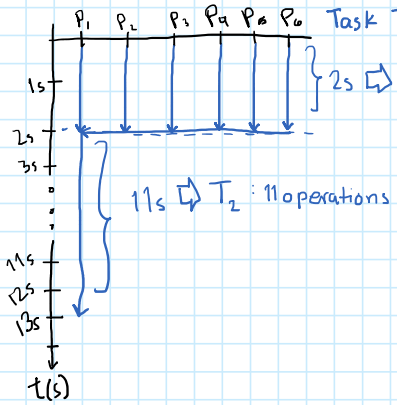
Union



Mapping



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



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

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

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

Ex 3

Sunday, January 30, 2022 10:50 AM

(3) 3 processors, data partition

Data: abcfgv hbc dsb

1 2 3

Solution

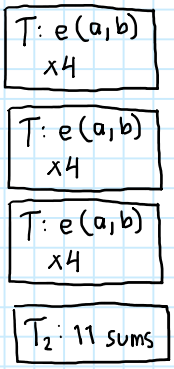
3 processors → 3 data partitions

abcf | gvhb | cdsb

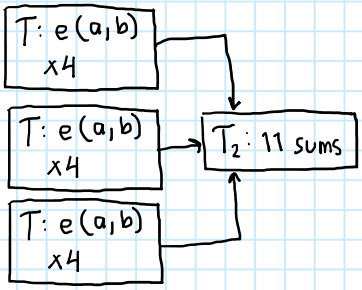
T: e(a,b) x4 — Task T receives 4 letters (that's why I put "x4")

Task T has 1 basic instruction that is executed on 1 data piece (4 letters) = 4 operations

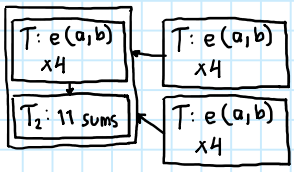
Partitioning



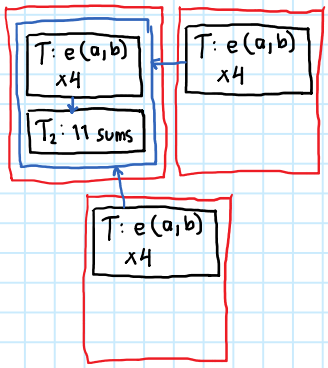
Communication



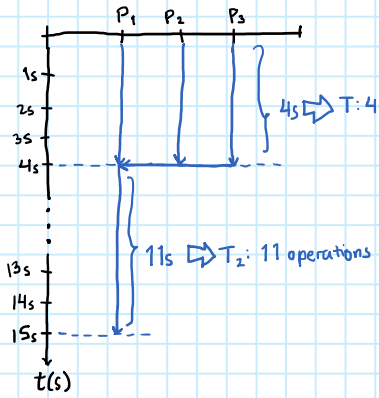
Union



Mapping



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



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

$t_{TOTAL} = \max\{15_s, 4_s, 4_s\}$

$t_{TOTAL} = 15_s$

Ex 4

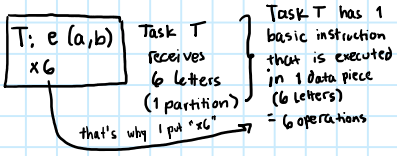
Sunday, January 30, 2022 11:13 AM

(4) 2 processors, data partition

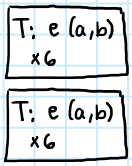
Data: a b c f g v | h b c d s b

1 2

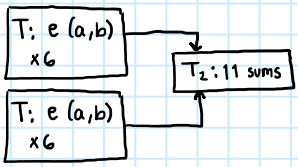
2 processors → 2 data partitions



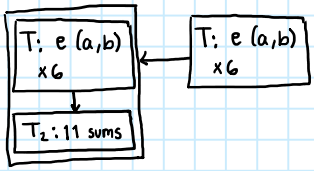
Partitioning



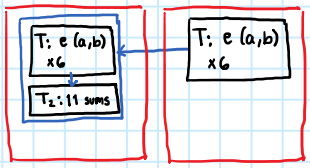
Communication



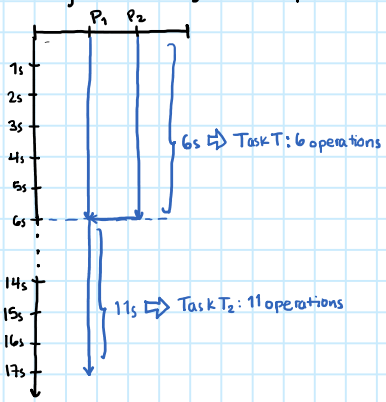
Union



Mapping



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



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

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

$t_{TOTAL} = 17s$