

# Parallel Computer Architecture: A Hardware/Software Approach

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## ERRATA FOR FIRST PRINTING\*

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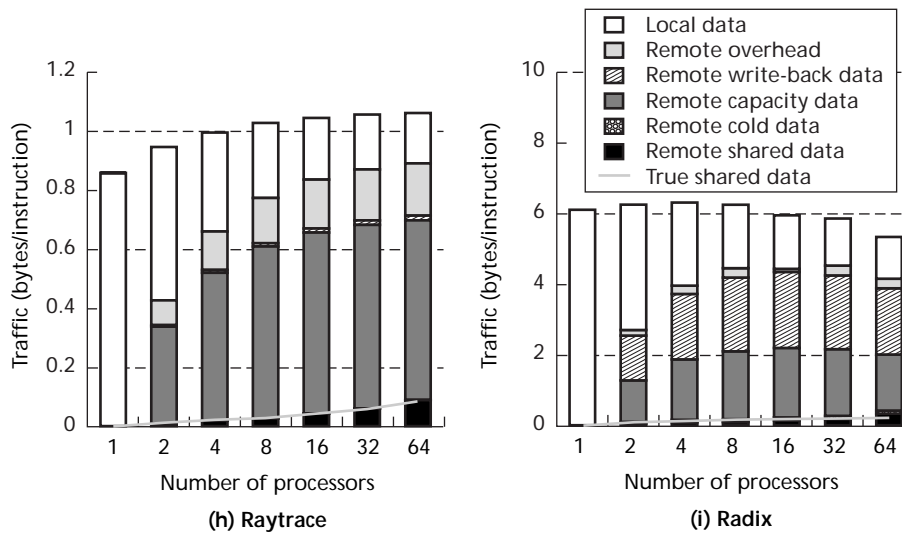
	<b>Page</b>	<b>Error</b>
1.	60	Equation 1.4, change $\frac{T_0}{B}$ to $T_0B$
2.	73	Exercise 1.9, replace the last three sentences, the first beginning "Compare this..." with "Graph the average message rate as a function of $m$ for various values of $T = 100$ ns, 200 ns, 400ns, 800 ns. What is the asymptote?"
3.	73	Exercise 1.15, replace the last two sentences, the first beginning "If data undergoes..." with "Assume that before transmitting a message, the data must be copied into a buffer. The basic message time is as in Exercise 1.14, but the copy is performed at a cost of 5 cycles per 32-bit word on a 100-MHz machine. Give an equation for the expected user-level message time. How does the cost of a copy compare with a typical fixed cost of entering the operating system?"
4.	74	Exercise 1.16, line 6, delete "50% of"
5.	74	Exercise 1.17, lines 1-2, delete "leaving 50% headroom on the bus to make the calculation reasonable"
6.	94	Figure 2.7, line 14, delete "diff = 0,"
7.	104	Figure 2.13, line 15, change "/*outer loop over all diagonal elements*/" to "/*loop until converge*/"
8.	106	Line 4, change "cell_lock" to "diff_lock"
9.	107	Figure 2.14, change "b: flag" to "b: flag = 1;" and delete "=1;" after "a: while (flag is 0) do nothing;"
10.	114	Figure 2.17, align lines 25k and 25m with "if" in 25c
11.	133	Figure 3.4, in both cases, change $\frac{n}{p}$ to $\frac{n}{\sqrt{p}}$
12.	166	Figure 3.15, swap placement of graphs a and b
13.	166	Figure 3.15, line 2 of the figure caption text, change " $1,030 \times 1,030$ " to " $1,026 \times 1,026$ "

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\* All line numbers refer to running text and do not include tables, figures, or code samples

14. 174 *Figure 3.19*, change "costzone" to "costzones"
15. 179 *Figure 3.21*, swap placement of graphs a and b
16. 255 *In the line for the Radix*, make the following changes:  
 "256-K points" to "256-K integers"  
 "84.62" to "14.02"  
 "14.19" to "5.27"  
 "7.81" to "2.90"  
 "6.38" to "2.37"  
 "3.61" to "1.34"  
 "2.18" to "0.81"
17. 308 *In the Radix section*, replace the data with the following:
- |    |          |          |          |          |          |
|----|----------|----------|----------|----------|----------|
| NP | 0        | 0        | 0.004746 | 3.524705 | 11.41111 |
| I  | 0.130988 | 0        | 0        | 1.108079 | 4.57868  |
| E  | 0.000759 | 0.002848 | 0.080301 | 0        | 0.00019  |
| S  | 0.029804 | 1.120988 | 0        | 178.1932 | 0.817818 |
| M  | 0.044232 | 11.53127 | 0        | 4.03157  | 802.282  |
18. 309 *In the Raytrace section*, under "S", change "0.15486" to "1.5486"
19. 309 *In the sentence at the bottom*, insert "(except for Multiprog, which is for 8 processors)" after "The data assumes 16 processors"
20. 310 *Line 16*, delete "or per FLOP"
21. 310 *Line 8*, delete reference to footnote 5
22. 310 *Paragraph after "Answer"*, move inline with "Answer" and insert reference to footnote 5 after the last sentence
23. 310 *In the footnote, lines 4-5*, replace "the bus traffic data that we will compute using these numbers" with "how we compute data traffic, but it means that instruction traffic is computed differently"
24. 313 *Line 11*, change "depend" to "depends"
25. 313 *Lines 15-16*, delete "64 KB"
26. 313 *Line 17, after the sentence ending "cache hierarchy,"* insert the following sentence, "We use 64-KB caches here, which fit all but the largest working set for these problem sizes."
27. 314 *In the Radix section*, replace the data with the following:
- |    |          |          |          |          |          |
|----|----------|----------|----------|----------|----------|
| NP | 0        | 0        | 9.440787 | 2.557865 | 27.36084 |
| I  | 4.354862 | 0        | 0.00057  | 0.157565 | 1.499903 |
| E  | 8.148377 | 0.001329 | 140.9295 | 0.012339 | 0.126621 |
| S  | 3.825407 | 0.481427 | 0        | 102.4144 | 0.484464 |
| M  | 23.03084 | 5.629429 | 0        | 2.069604 | 717.1426 |
28. 318 *Line 18*, change "(case 11)" to "(case 9)"

29. 346 *Lines 9-10, replace "down from  $O(p^2)$  to  $O(p)$  per lock acquisition, but still increases with the number of processors" with "and there are no read-modify-write bus transactions, but traffic still increases linearly with the number of processors (i.e.,  $O(p)$  bus transactions per lock acquisition)"*
30. 396 *Line 1, change " $>=$ " with " $\geq$ "*
31. 396 *Line 4, change " $=<$ " to " $\leq$ "*
32. 571 *Line 26, after the sentence ending "flat directory protocol", add the following two sentences, "Two changes are made from the experiments in Chapter 5. Since Radix sorting would exhibit a lot of false sharing at larger processor counts (our default here is 32 rather than 16 processors), we use a problem size of 1M rather than 256K keys. And we use 8-KB rather than 64-KB caches in all our smaller cache size experiments, to see the effect of even fewer working sets fitting in the cache."*
33. 581 *Figure 8.10, line 2 of the figure caption text, change "64 KB" to "8 KB"*
34. 581 *Figure 8.10, replace graphs h and i with the following:*

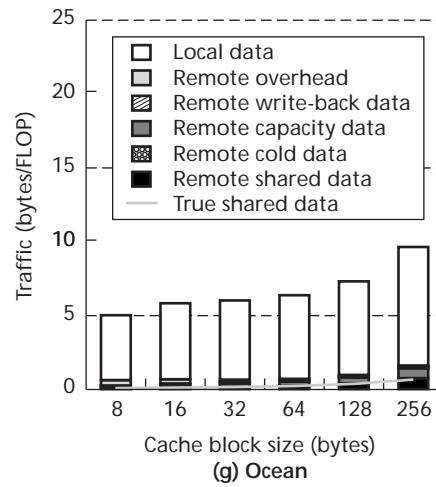


35. 583 *Figure 8.11, line 1 of the figure caption text, insert "Data are shown for 32-processor executions." before the sentence beginning, "The overhead. . ."*
36. 583 *Figure 8.11, line 2 of the figure caption text, change "64-KB" to "8-KB"*

37.

583

Figure 8.11, replace graph g with the following:



38.

619

Table 8.1, 3rd and 4th columns, rows 4-6, make the following changes:

"690" to "582"      "564" to "449"

"890" to "775"      "759" to "621"

"991" to "826"      "862" to "702"

39.

620

Line 9, change "most notably" to "to an extent"

40.

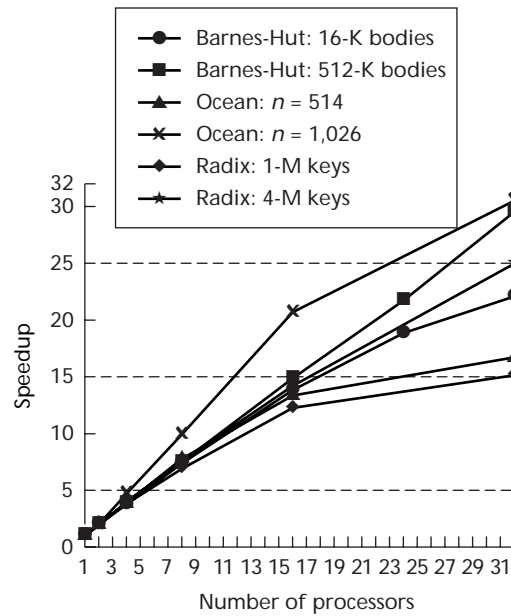
620

Line 16, change "doesn't alleviate the situation" to "only alleviates false sharing"

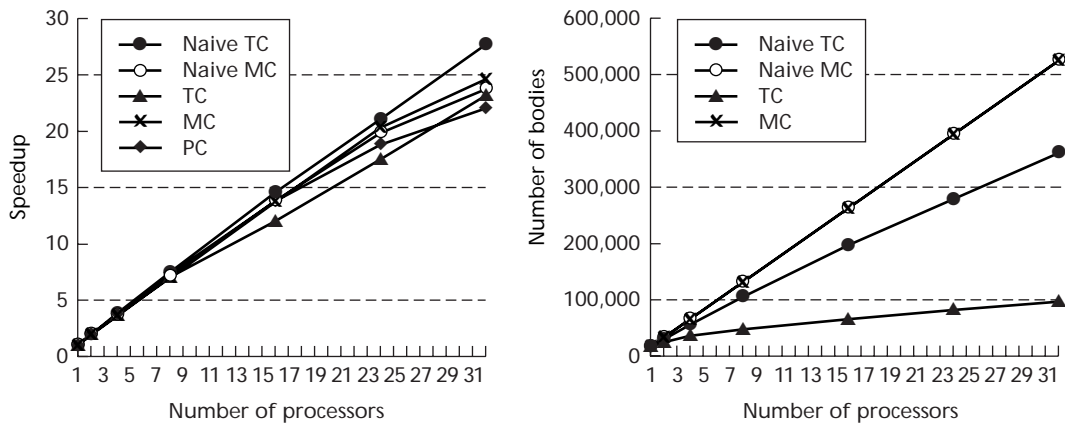
41.

621

Figure 8.22, replace the graph on the left with the following:



42. 622 *Figure 8.23, replace with the following:*



(To show the Naïve MC line more clearly, its marker has been changed to an unfilled circle.)

43. 649 *Lines 37-38, delete "and in fact the queuing lock incurs contention on its compare&swap operations (implemented with LL SC) and scales worse than the array lock."*

44. 650 *Figure 8.34, replace graph a with the following:*

