

[Leighton, Tom](#)

Tight bounds on the complexity of parallel sorting. (English) Zbl 0556.68024
[IEEE Trans. Comput.](#) 34, 344-354 (1985).

In this paper, we prove tight upper and lower bounds on the number of processors, information transfer, wire area, and time needed to sort N numbers in a bounded-degree fixed-connection network. Our most important new results are: 1) the construction of an N -node degree-3 network capable of sorting N numbers in $O(\log N)$ word steps; 2) a proof that any network capable of sorting N $(7 \log N)$ -bit numbers in T bit steps requires area A where $AT^2 = \Omega(N^2 \log^2 N)$; and 3) the construction of a "small-constant-factor" bounded-degree network that sorts N $\Theta(\log N)$ -bit numbers in $T = \Theta(\log N)$ bit steps with $A = \Theta(N^2)$ area.

MSC:

[68P10](#) Searching and sorting
[68Q25](#) Analysis of algorithms and problem complexity
[68N25](#) Theory of operating systems

Cited in **1** Review
Cited in **24** Documents

Keywords:

[parallel sorting](#); [area-time tradeoffs](#); [circuit complexity](#); [communication complexity](#); [packet routing](#); [parallel computation](#); [VLSI](#); [bounded-degree fixed-connection network](#)

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