

Exercises for the Lecture: “Architecture and Programming
Models for GPUs and Coprocessors”
Exercise Sheet № 9

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9 Bitonic Sort

Ex. 9.1

Consider the following comparator network that is known from the lecture

$$N_n = C\left(0, \frac{n}{2}\right), C\left(1, \frac{n}{2} + 1\right), \dots, C\left(\frac{n}{2} - 1, n - 1\right)$$

for input sequences

$$A(n) = a_0, \dots, a_{n-1}$$

with:

$$\begin{aligned} a_0, \dots, a_{\frac{n}{2}-k-1} &= 0 \\ a_{\frac{n}{2}-k}, \dots, a_{\frac{n}{2}+l-1} &= 1 \\ a_{\frac{n}{2}+l}, \dots, a_{n-1} &= 0, \end{aligned}$$

where $l, k > 0$. Show *graphically* that applying N_n splits the sequence $A(n)$ into two *bitonic* subsequences of length $\frac{n}{2}$ and that elements $a'_i, i = 0, 1, \dots, \frac{n}{2} - 1$ from the “left” subsequence are \leq the associated element $a'_i, i = \frac{n}{2}, \frac{n}{2} + 1, \dots, n - 1$ from the “right” subsequence. Show this for all possible cases of $A(n)$.

