

EXAMENSARBETE Implementing a streaming application on a processor array – A case study on the Epiphany architecture

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Breaking an application to pieces and running them in parallel

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A modern way of processing information is to do it in parallel. This master's thesis conducts a case study of how to parallelize an application on a highly parallel platform.

We have worked on making a computer program, meant to run on one processor or run on several processors on a very special computer. This computer is called "Parallella" and has sixteen small processors, but future models could possibly have thousands! This means that it can do a lot of things at once, which defines the term parallel computing. It can be hard to divide a large program to make it work on many processors. We have done just that, but there is a catch!

The program must have been built in a certain way. It must consist of many small programs that mostly do not affect each other. The only way one of these programs can "talk" to one another is by sending packets to the receiver's mailbox.

The program we used was not specifically planned to work on a computer like the Parallella, but it was built as described earlier. This meant that we could split up the program and make it run on several processors. This required us to build special mailboxes, that could work for the communication between programs on different processors.

Mailboxes are of little use if we do not know the addresses. We came up with a system that works like a bulletin board, where each processor could let the other know where it could be found.

To summarize, one can say that we have broken a program to small pieces, placed these pieces on different processor cores, built special mailboxes between the

cores and set up a bulletin board to keep track of the mailboxes.

A layman may ask what the point is of doing all this. Our answer is, that this Master Thesis is mainly to aid future research on how to advance in the field of parallel computing.

Another question that may arise is, why is it beneficial to advance in the field of parallel computing? The reason why this is an important area is because regular computers, smartphones, tablets and other common devices are getting more processor cores for every year that passes. In order to harness the power of the extra cores, parallel computing must exist. If our research can aid the development in parallel computing, more processor cores may be able to cooperate effectively.

Are there any consequences that may arise with the increased parallelism in devices and applications? Our answer to this question is that it depends on if you are a user or a developer. From a user's perspective, there will probably be no drawbacks. From a developer's perspective, the drawback is that it is harder to program many cores to cooperate effectively in parallel. More cores means more things to consider, which make it harder to develop applications. Our Master Thesis research tries to counter this problem, by developing structures that simplifies the process of parallelizing certain applications.