

EXAMENSARBETE High-performance signal processing for digital AESA-radar

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Flight-radar Processing Using Streaming Frameworks

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The demands on signal processing for digital flight-radars are rising rapidly. To solve these demands, stream processing frameworks are evaluated. These frameworks are an interesting and engineer efficient solution to help reduce development time, as well as keeping a good performance.

The lifespan for a typical radar application is around 15-20 years. This translates to several generations when it comes to the lifespan of technology. Therefore it is important to have a stable and engineering efficient API, which does not need to be updated every time the hardware is being improved.

Apart from this, the demands for fast and correct information in flight-radars sets high requirements on the system. For a potential target, e.g. another airplane, to be discovered and evaluated by the radar, lots of computations needs to be performed. To successfully do this parallel hardware architectures are being used, performing several operations concurrently.

What makes frameworks interesting when it comes to radar applications, is that they can scan the hardware and be able to adapt itself accordingly. Making them a suitable choice for long lived APIs. They also assist with the parallelization, thereby contributing towards engineering efficiency.

The frameworks belong to a fairly old computer paradigm called stream processing. Stream

processing focuses on handling data as soon as it arrives to the system, as well as being effective on moving data. Complete stream processing frameworks focusing on real-time signal processing are evaluated, and noted to be an interesting solution to solve the issues raised by flight-radars.

The main frameworks covered are: RaftLib - a template library for C++ and Apache's Flink - a Java/Scala library. Flink is showing most promise of the two, and RaftLib also being an interesting candidate, but being a bit undeveloped with an unsure future.

Other interesting areas within stream processing are also covered and can be read in the thesis; High-performance signal processing for digital AESA-radar by Alexander Olsson, dat12aol@student.lu.se - Faculty of Engineering, LTH.