Technology Transfer in Computing Systems

D3.18: Individual TTP18 abstract

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TETRACOM D3.18: multi-ConstellATion software GNSS receiver (CAT-GNSS)

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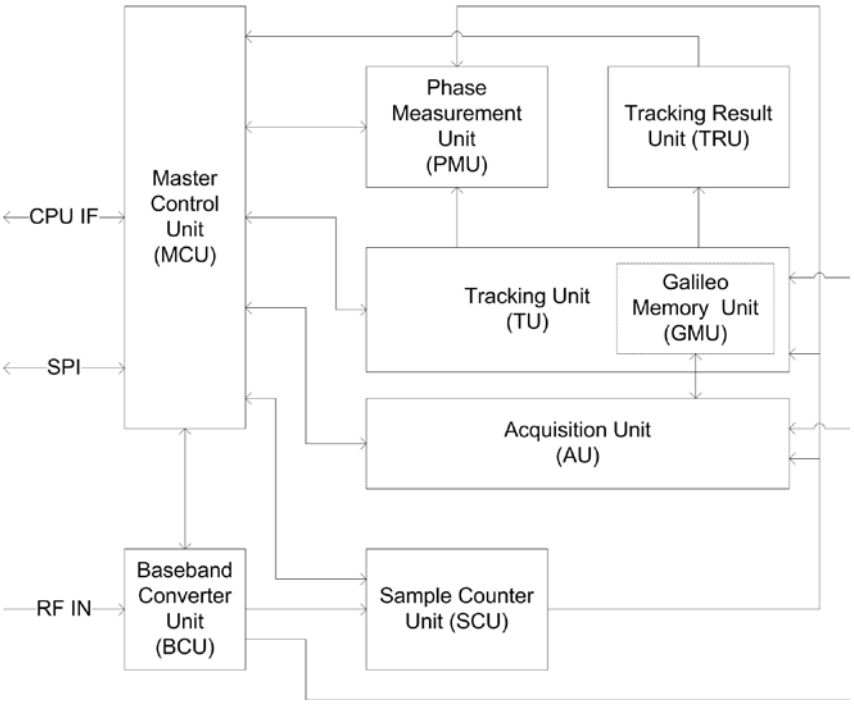
Positioning technologies are playing an increasingly important role in the contemporary society. The global navigation market (products and services) is expected to exceed 160 billion EUR revenue in 2015 with significant growth being driven by mobile terminals. Future wireless society needs trustworthiness of the wireless positioning device and eco-friendliness of the transmission-reception process. These are triggered by the user requirements, preferences and targeted applications, and by the type of the environment where navigation takes place.

Tampere University of Technology (TUT) has developed receiver technology for different Global Navigation Satellite Systems (GNSS) for the past 15 years. One of the outcomes is the "TUTGNSS" positioning receiver baseband prototype, currently capable to receive GPS L1 and L5 and GALILEO E1 and E5a band signals (when equipped with RF front end(s) capable to receive these bands). The implementation is based on hardware for the computationally intensive parts, controlled by processor software via a register interface. The current implementation runs on Altera Stratix-2 development board, using Altera NIOS-2 processor for controlling the hardware, and also to implement an exemplary software program for computing the Position, Velocity and Time (PVT) solution based on the measurements on hardware.



As shown in the figure above, the hardware consists of correlators for satellite search (acquisition), tracking of BPSK and BOC modulated signals (GPS, GALILEO) in a delay-locked loop setup of a number of correlator channels, a unit for collecting the decoded data bitstream, and measurement of code and carrier phase of the received satellite signals. In addition, there is the conversion of incoming sampled data into the internal representation format and timestamping of data samples. Everything is controlled by a master control unit which also carries out the necessary communication with the control processor.

In this TTP, we are focusing on transferring the TUTGNSS baseband hardware to be used by Catena for integration into future wireless products. In combination with Catena FM+GNSS front-end and a control processor, the hardware parts of TUTGNSS will be adapted to receive GPS, GALILEO and BEIDOU signals and produce raw data for the position calculation software (which is typically a proprietary solution of the end customer).

In particular, this TTP needs to concentrate on:

- interfacing Catena front-end and existing TUTGNSS prototype implementation for interoperability
- specification of selected features and their hardware implementations foreseen relevant for Catena
- tailoring the multi-GNSS hardware for three satellite systems on a single frequency band
- functional testing of the enhanced receiver chain based on the Catena front-end and an FPGA prototype of the baseband using TUT's multi-constellation hardware simulator

Catena is an international group of innovative companies, experts in design of Integrated Circuits and independent IP. Catena has since its establishment in 1986 developed as a center of excellence in Radio Frequency Communication, Analog, Mixed Signal and Digital Signal Processing. The group is located in high tech areas in the Netherlands, Sweden, Germany and Austria, with headquarters in Delft, the Netherlands. Catena's IP roadmap main focus is on high performance RF, mixed-signal and ultra low power DSP solutions in the areas of wireless and consumer applications. In this TTP, the company gains the capability to design complete multi-GNSS circuits.