Software modernization in support of LEO and multi-constellation processing

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The processing of GNSS data from low Earth orbiters typically involves a change of the data sample interval from 5 minutes down to 30 seconds, leading to an increase in the number of processed observations and estimated clocks by one order of magnitude. Within the constraints set by available hardware and required IGS product latencies, such an increase in process size requires maximum efficiency from the processing systems at the IGS Analysis Centres. Furthermore, multi-constellation solutions introduce signals and receivers from GPS, GLONASS and Galileo in one single process. This not only leads to a further increase of process size, but in addition requires a high level of flexibility to cope with constellations of varying size and composition.

Although information technology has advanced rapidly over the past decades, and has provided many new ways for coping with such increased demands to large software systems, the world of science still seems to depend mainly on large, complex FORTRAN systems. At ESOC's Navigation Office, a prototype C++ system is being developed that explicitly minimizes the use of memory and CPU, supports multi-CPU parallelization, and has a generic interface with a high level of autonomy. The main objectives of this development are:

- to maximize processing efficiency, thereby allowing large processes like 30 second rate solutions with LEO and GNSS constellations
- to reduce overall system complexity, allowing easier modifications of the software as well as shorter familiarization periods for new staff
- to reduce the effort in setting up POD software for different projects or applications.

An overview of this prototype system will be presented, together with some examples of current performance levels.