Towards an RTOS for Self-optimizing Mechatronic Systems
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The next generation of advanced mechatronic systems is expected to behave more intelligently than today's systems. They adjust their goals and behavior according to changes of the environment or system. Characteristic for these modern applications are the increasing dynamics. To handle this dynamics new approaches in the underlying system software are required.

Predictability is of paramount importance for mechatronic systems. Thus, their design has to take the worst-case into account and the maximum required resources are usually allocated upfront by each process. This is safe, but usually results in a rather poor resource utilization.

For a better utilization of the system the Flexible Resource Manager puts temporarily unused resources at other applications' disposal. To consume freed resources the applications can specify additional modes with higher resource consumptions. To allow over-allocation of resources under hard real-time constrains an acceptance test is checking, if a possible conflict can be solved without violating deadlines of hard real-time tasks. An atomic reconfiguration process is necessary, with the constraint that no hard timing constraint is violated.

This approach is also applied to the operating system (OS) itself. The resource usage implies the services that the applications require from the OS. Thus, the OS must either provide all services that are totally required over time or reconfigure itself. Reconfiguration of the OS means supporting on demand services or the possibility of degrading services. An approach is presented where an offline customizable OS is extended in order to be dynamically reconfigurable during run-time.