1. Introduction

In the Grid Computing paradigm of Advanced Reservation it is necessary to appoint a Program Execution Plan according to which jobs are distributed and run on the compute Grid nodes. The advantage hoped for, over traditional approaches based on job-queues, is a guaranteebility in Quality of Service, esp. regarding the fulfilment of deadlines [1].

That demands for a novel Plan-Based Scheduler in addition to the common Queue-Based Schedulers in nowadays Operating System (OS) Kernels [2].

Given the striven for flexibility of a Grid's structure and the heterogenity of the participating nodes it seems, that the required planning functionalities should be addable to the nodes' OS Kernel in runtime. Therefore the on-demand integration of a Plan-Based Scheduler in an already running OS via a Loadable Kernel Module [3], as simplifiedly depicted in Fig.1, shall be discussed in this thesis.

![Diagram of Grid Compute Node](image)

**Fig.1** Implementing a Plan-Based Scheduler (PBS) as a Loadable Kernel Module, communicating with a Resource Management System (RMS) Stub via an interface employing the Kernel's I/O Control (IOCTL) facility. The parts to be developed in this thesis are marked grayish.
2. Objective

The thesis' goal is to examine the feasibility of a placement of the Plan-Based Scheduler into a Loadable Kernel Module. That requires the following.

1. Development of a Loadable Kernel Module to extend the OS Kernel by a Plan-Based Scheduler,

2. Implementation of a RMS Stub as a user space program to monitor the functionality of the loaded PBS kernel module, because a fully functional RMS is not, resp. not yet, available,

3. Simple test of the such extended Kernel regarding the acceptance, execution and monitoring of a plan-based program run, and

4. Testing the integrity of the OS after the Loadable Plan-Based Scheduler Kernel Module's removal, i.e. basically that the usual mode of working of the OS is ensured.

3. Environment

In principle the intended procedure should be applicable likewise on a series of OSs, inter alia Linux [3], FreeBSD [4], and even Windows [5]. Thereby of course also the heterogeneity of Grids would be supported.

In this thesis it will be experimented with Debian GNU/Linux firstly -- as a Guest OS in a QEMU-based Virtual Machine to avoid peril for the integrity of the computer's OS.

4. References


