

## Title

Operating System Support for Grid Architectures

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## Abstract

In this work, we demonstrate the power of providing a common set of operating system services to Grid Architectures, including high-performance I/O, communication, resource management and process management. A Grid[1] enables the sharing, selection, and aggregation of a wide variety of geographically distributed resources including supercomputers, storage systems, data sources, and specialized devices owned by different organizations administered with different policies. In the last few years, a number of exciting projects like Globus[2], Legion[3], and UNICORE[4] developed the software infrastructure needed for grid computing. However, operating system support for grid computing is minimal or non-existent. Tool writers are forced to re-invent the wheel by implementing from scratch. This is error prone and often results in sub-optimal solutions. To address these problems, we are developing GridOS, a set of operating system services that facilitate grid computing. The services are designed to make writing middleware easier and make a normal commodity operating system like Linux highly suitable for grid computing. The modules are designed to be policy neutral, exploit commonality in various grid infrastructures and provide high-performance. Experiments with GridOS verify that there is dramatic improvement in performance when compared to the existing grid file transfer protocols like GridFTP[5]. Our proof-of-concept middleware shows that writing middleware is easy using GridOS.

## References

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- [3] A. S. Grimshaw, W. A. Wulf, and the Legion team, "The legion vision of a worldwide virtual computer," *Communications of the ACM*, vol. 40, no. 1, pp. 39–45, Jan. 1997.
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## **Proposal for Technical Demonstration**

GridOS, a common set of operating system services for Grid Architectures offers an easy and flexible way to convert a commodity operating system like Linux into grid enabled operating system. It also facilitates quick development of middleware like Globus.

In this demonstration, we show various aspects of GridOS. First, we would like to show the ease with which the GridOS modules can be inserted and removed. We show the drastic performance improvement in FTP using GridOS FTP modules over a stock Linux kernel. This is achieved by avoiding copying buffers between user and kernel mode. Then, we demonstrate the high-performance I/O achieved by using the GridOS I/O module. The comparison is done with GridFTP. We transport files of various sizes ranging from 1K to 1G. Next, we show the API (Application Programming Interface) provided by GridOS. We write a small application in a matter of minutes and show the ease of development of middleware. We conclude by showing our proof-of-concept middleware that exploits the facilities provided by GridOS.