

Dynamic Adaptability in Support of Extreme Scale Systems

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Conventional operating systems (OS) are statically compiled and have generalized algorithms and policies for fair and efficient management of computational and communication resources. This provides a general execution environment for all applications, but not one that is best for all. Accordingly, applications, in particular those targeted at extreme scale systems, may not achieve the performance they could achieve otherwise, i.e., with dynamic adaptability.

To provide dynamic adaptability and, thus, a performance-rich environment for applications, the DAiSES project will develop a methodology for incorporating dynamic, adaptive monitoring of system performance and dynamic, adaptive functionality into the operating system. This methodology will permit the OS to dynamically monitor performance and dynamically adapt the OS, when necessary, to provide the best possible execution environment for the application. Dynamic adaptation replaces and evolves OS modules in response to changes in system behavior.

The DAiSES work will provide novel techniques that will enable dynamic adaptation of commodity operating systems and will implement these techniques in the Linux kernel. In collaboration with IBM's Linux performance group, we will dynamically instrument Linux for the Power series to permit self-measurement and self-adaptation.