Operating System Architecture with Process Migration Support

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ABSTRACT

This paper discusses the problem of building an operating system with process migration support. Process migration is the act of transferring a process between two machines. It enables dynamic load distribution, fault resilience, and data access locality. In the first section of the paper we formulate the major requirements for process migration mechanism, namely: enabling migration of broad class of processes, eliminating residual dependencies, minimizing migration latency time, supporting eviction of processes to their home nodes and subsequent migration, and allowing migration of a process at any moment of its execution. In order to compare migration in UNIX to that in microkernel-based systems, we describe process migration mechanisms implemented in Sprite and Mach operating systems.

The second section describes a proposed operating system architecture aimed to provide process migration facility that will meet the indicated requirements. The state of a process is modeled by a set of objects. The process migrates to a new node together with all objects that it uses. If an object is used in several nodes, it will have a copy in each of these nodes. Copy coherence is provided by replication algorithms. The combination of process migration and object replication allows implementing various load balancing strategies and providing increased reliability and fault resilience of the system.