**Concurrency: Practice and Experience**
**Published Abstracts for 1998**

## Indigo: User-level Support for Building Distributed Shared Abstractions

*Prince Kohli, Mustaque Ahamad and Karsten Schwan*

Distributed systems that consist of workstations connected by high performance interconnects offer computational power comparable to moderate size parallel machines. Middleware like Distributed Shared Memory (DSM) or Distributed Shared Objects (DSO) attempts to improve the programmability of such hardware by presenting to application programmers interfaces similar to those offered by shared memory machines. This paper presents the portable *Indigo* data sharing library which provides a small set of primitives with which arbitrary shared abstractions are easily and efficiently implemented across distributed hardware platforms. Sample shared abstractions implemented with Indigo include DSM as well as fragmented objects, where the object state is split across different machines and where interfragment communications may be customized to application-specific consistency needs. The Indigo library's design and implementation are evaluated on two different target platforms: a workstation cluster and an IBM SP2 machine. As part of this evaluation, a novel DSM system and consistency protocol are implemented and evaluated with several high performance applications. Application performance attained with the DSM system is compared to the performance experienced when utilizing the underlying basic message-passing facilities or when employing Indigo to construct customized fragmented objects implementing the application's shared state. Such experimentation results in insights concerning the efficient implementation of DSM systems (e.g., how to deal with false sharing). It also leads to the conclusion that Indigo provides a sufficiently rich set of abstractions for efficient implementation of the next generation of parallel programming models for high performance machines.

**Short Code:** [Kohli:98a]

**Reference:** Vol. 10, No. 1, pp. 1–29 (C326)