Le, H. "Harry", "Configurable Networks"

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The network switch is a key component of a parallel computer system. The performance of the system depends on the performance of the switch under different applications. Configurable networks offer the flexibility of reconfiguring the network to provide the optimal cost required by the application. Configurable networks can out-perform fixed configured networks by doing the configuration either dynamically or statically. We proposed two new approaches in this dissertation. In the first approach, our contribution is that through simulation, we created a reference library of parameter settings that will provide the best results in terms of latency or throughput for each type of traffic load. Given a workload, using this reference table, we can pre-configure a network to obtain a near optimal performance.Another new contribution we will discuss involves using what we call 'emergent' reconfigurable behavior circuits that can dynamically shift resources among channels. This same hardware architecture can also be used to implement virtual output queues in a much simpler way than the DAMQ buffer approach [13]. Moreover, it provides more resource sharing than the DAMQ approach. In the DAMQ implementation, buffer space is shared between output queues inside only one input buffer whereas in our approach, the buffer space can be shared among the output queues inside an input buffer as well as with other input buffers.