Docket #: S07-359

Technology-Driven, Highly-Scalable Dragonfly Topology

Researchers in Prof. William Dally's laboratory have designed a dragonfly topology that reduces the cost of high-radix networks by reducing the number of long, global cables. This organization uses a group of high-radix routers as a virtual router to increase the effective radix of the network and each minimally routed packet traverses at most one global channel. By reducing global channels, a dragonfly reduces cost by 20% compared to a flattened butterfly and by 52% compared to a folded Clos network in configurations with ges 16K nodes. In addition, the inventors used selective virtual-channel discrimination and credit round-trip latency to both sense and signal channel congestion. The combination of these two methods gives throughput and latency that approaches that of an ideal adaptive routing algorithm.

Ongoing Research
The inventors plan to continue their work to analyze and evaluate the topology and develop appropriate routing algorithms.

Related Technolgies from The Dally Lab:

Stanford Docket S14-246 "Probabilistic Cache Replacement to Reduce Cache Misses"

Stanford Docket S12-374 "Power electronics system that harvests excess power from unbalanced photovoltaic modules to boost overall efficiency"

Stanford Docket S11-305 "Speculative Reservation Protocol"

Stanford Docket S07-039 "Flattened Butterfly: Cost-efficient High-Radix Topology"

Stanford Docket S12-138 "High-Radix Interprocessor Communications System and Method"

Applications

- **Interconnection networks for large scale systems**

Advantages

- **Low cost** - a dragonfly reduces cost by 20% compared to a flattened butterfly and by 52% compared to a folded Clos network in configurations with ges 16K nodes
- **Scalable**

Publications

- Kim, J.; Dally, W.J.; Scott, S.; Abts, D., "Technology-Driven, Highly-Scalable Dragonfly Topology," *Computer Architecture, 2008. ISCA '08. 35th International Symposium on*, vol., no., pp.77-88, 21-25 June 2008
- Current Version Published: 2008-07-15.

Patents

- Published Application: 20100049942
- Published Application: 20150186318
- Published Application: 20170353401
- Issued: 9,614,786 (USA)
- Issued: 10,153,985 (USA)

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