# MinBD: Minimally-Buffered Deflection Routing for Energy-Efficient Interconnect



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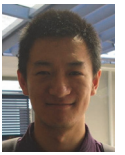
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A conventional Network-on-Chip (NoC) router uses input buffers to store in-flight packets. These buffers improve perfor- mance, but consume significant power. It is possible to bypass these buffers when they are empty, reducing dynamic power, but static buffer power, and dynamic power when buffers are utilized, remain. To improve energy efficiency, bufferless deflection routing removes input buffers, and instead uses deflection (misrouting) to resolve contention. However, at high network load, deflections cause unnecessary network hops, wasting power and reducing performance.

In this work, we propose a new NoC router design called the *minimally-buffered deflection* (MinBD) router. This router combines deflection routing with a small "side buffer," which is much smaller than conventional input buffers. A MinBD router places some network traffic that would have otherwise been deflected in this side buffer, reducing deflections significantly. The router buffers only a fraction of traffic, thus making more efficient use of buffer space than a router that holds every flit in its input buffers. We evaluate MinBD against input-buffered routers of various sizes that implement buffer bypassing, a bufferless router, and a hybrid design, and show that MinBD is more energy-efficient than all prior designs, and has performance that approaches the conventional input-buffered router with area and power close to the bufferless router.

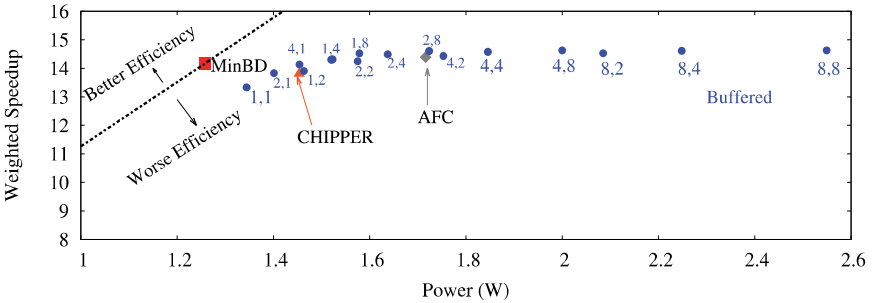


**Fig. 1.** Energy-Efficiency of MinBD vs. common baselines.