

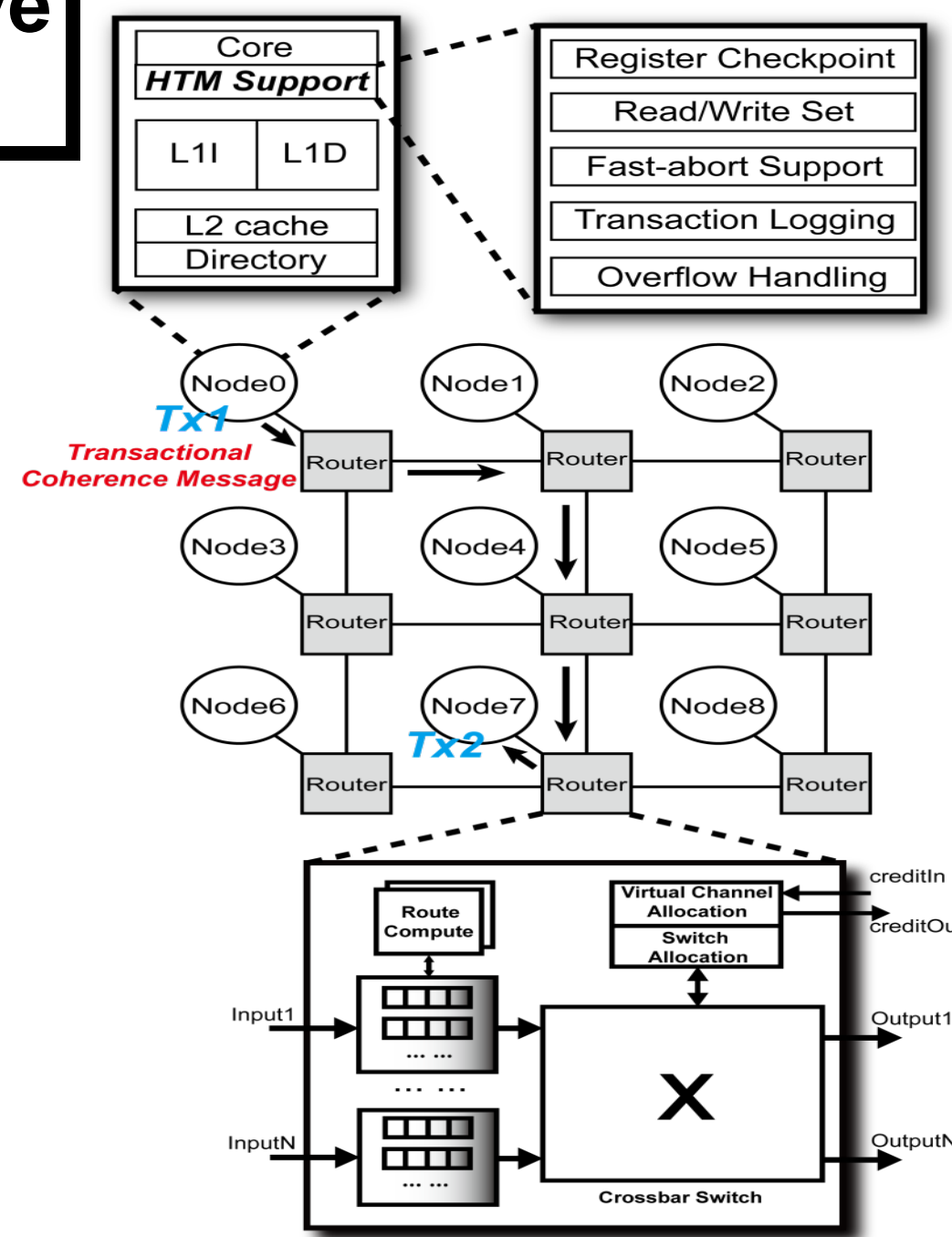
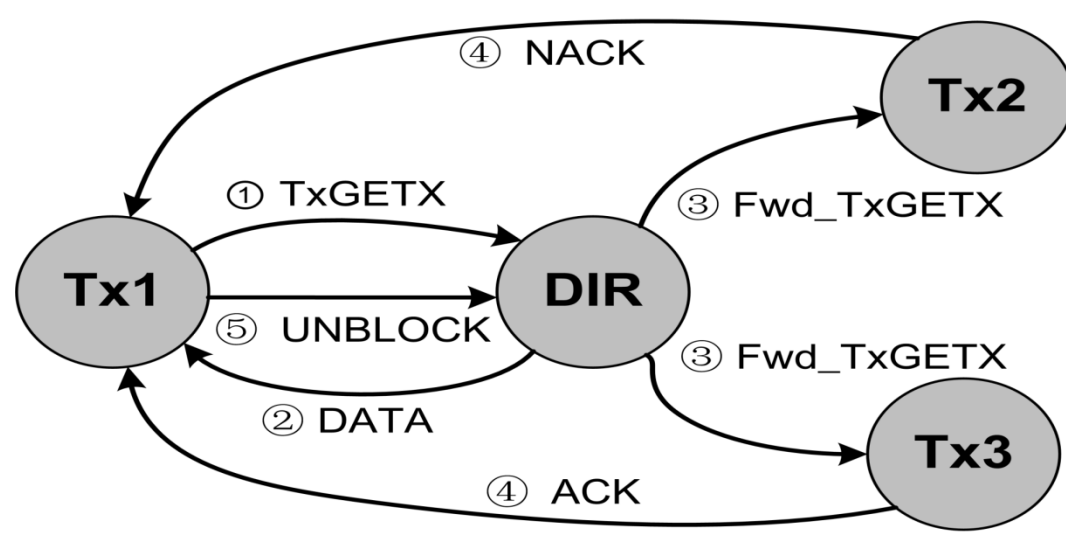
TMNOC: A Case of HTM and NoC Co-design for Increased Energy Efficiency and Concurrency

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HTM and NoC Interplay

Transactional Memory is an alternative to lock for concurrency control.

- Transaction (Tx): a code block that is executed atomically and in isolation.
- Transactional conflicts are detected using cache coherence protocols.



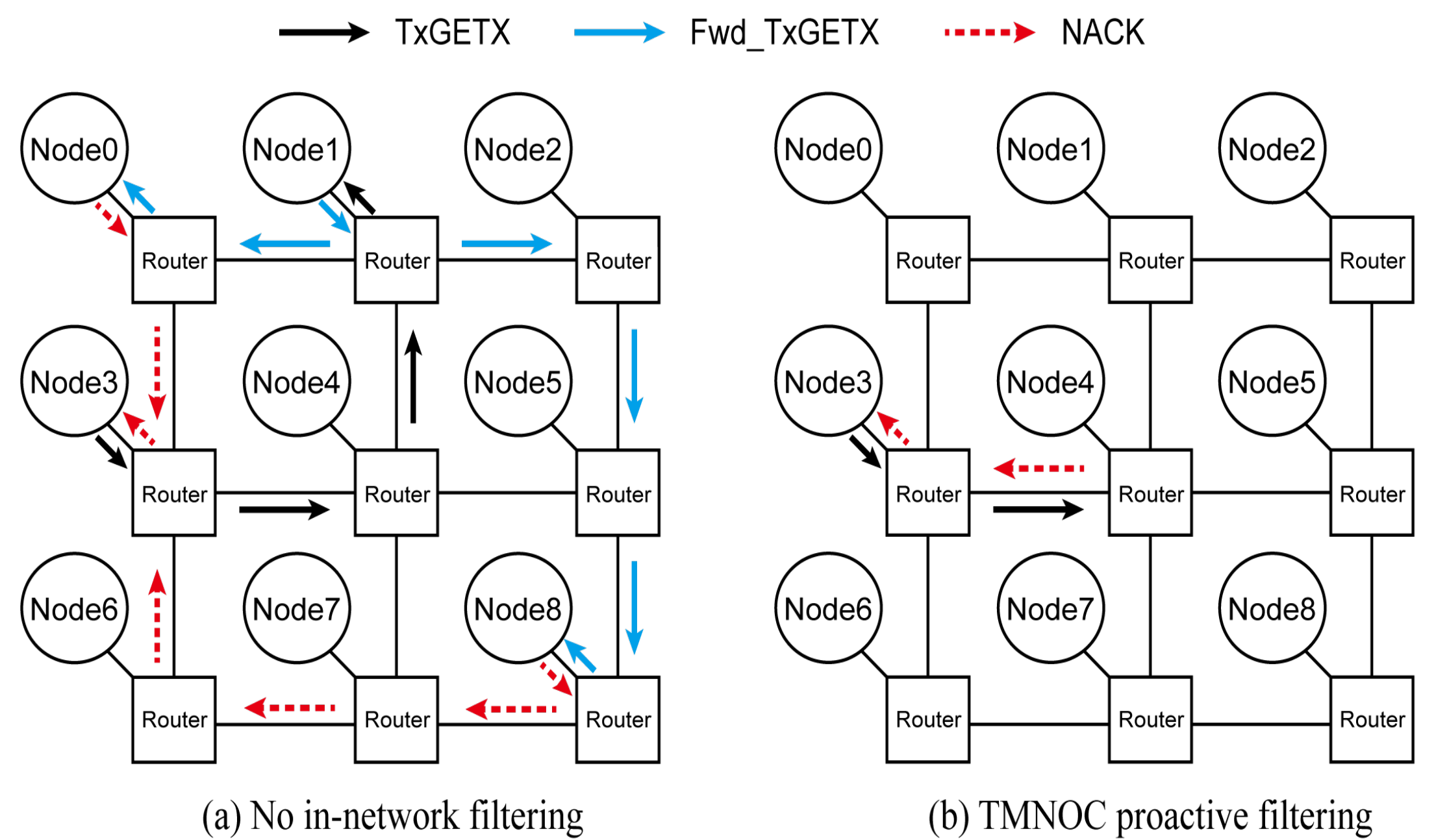
Networks-on-Chip emerges as the *de facto* solution for many-core processor.

- NoCs provide low-latency communication between transactions.
- Transactional communication has a substantial energy footprint on the NoCs.

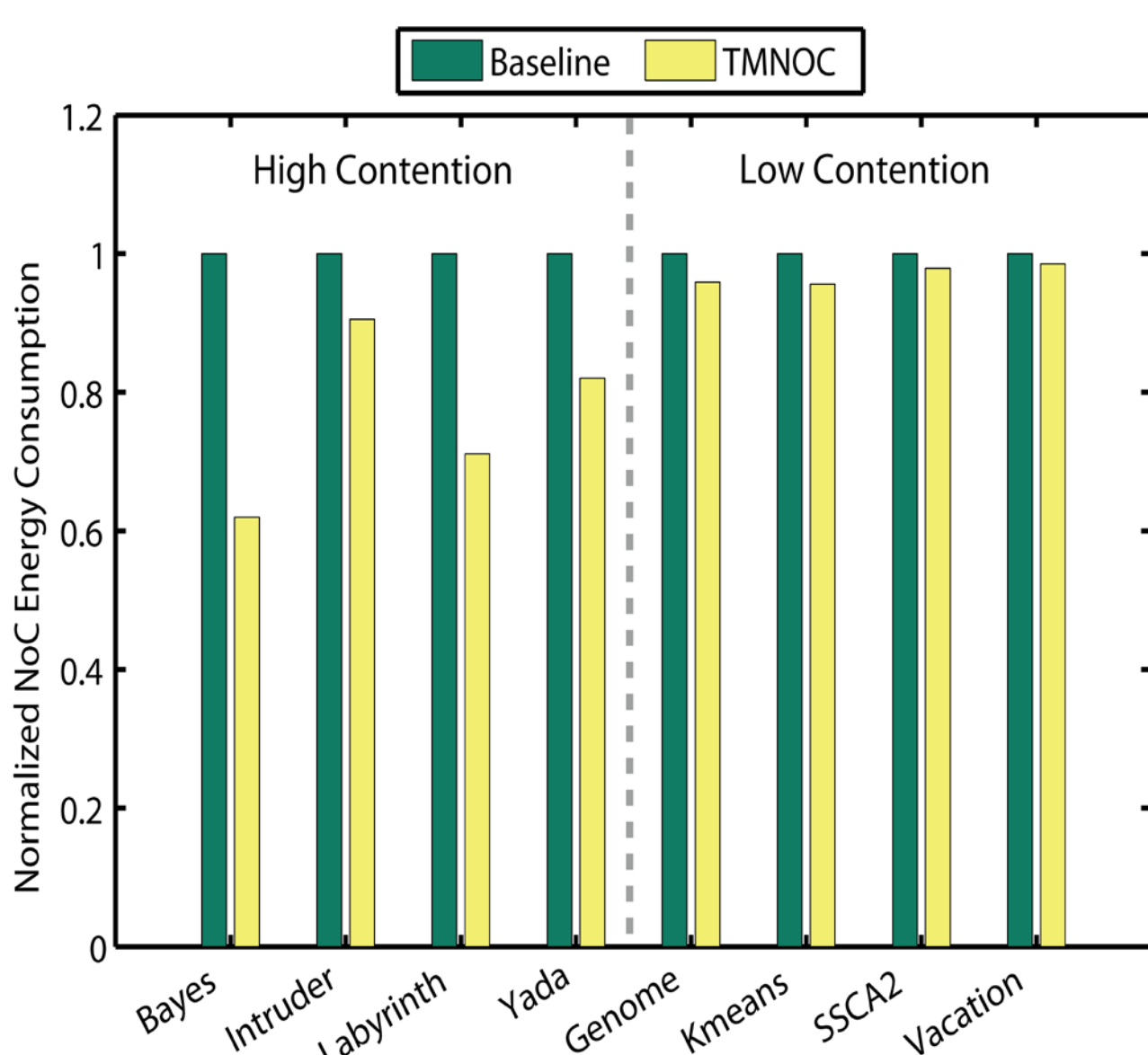
Need to investigate the interplay between HTM and NoCs.

TMNOC

- Transactional requests are expensive in terms of:
 - **Network Energy:** triggering coherence messages among requesters, directory and sharers.
 - **Concurrency:** blocking the directory entries.
- If the transactional requests are nacked:
 - No contribution to the progress of transactions.
 - Detrimental to energy efficiency and concurrency.
- **The proposed TMNOC approach:** use the NoC to proactively intercept nacked transactional requests as soon as possible.

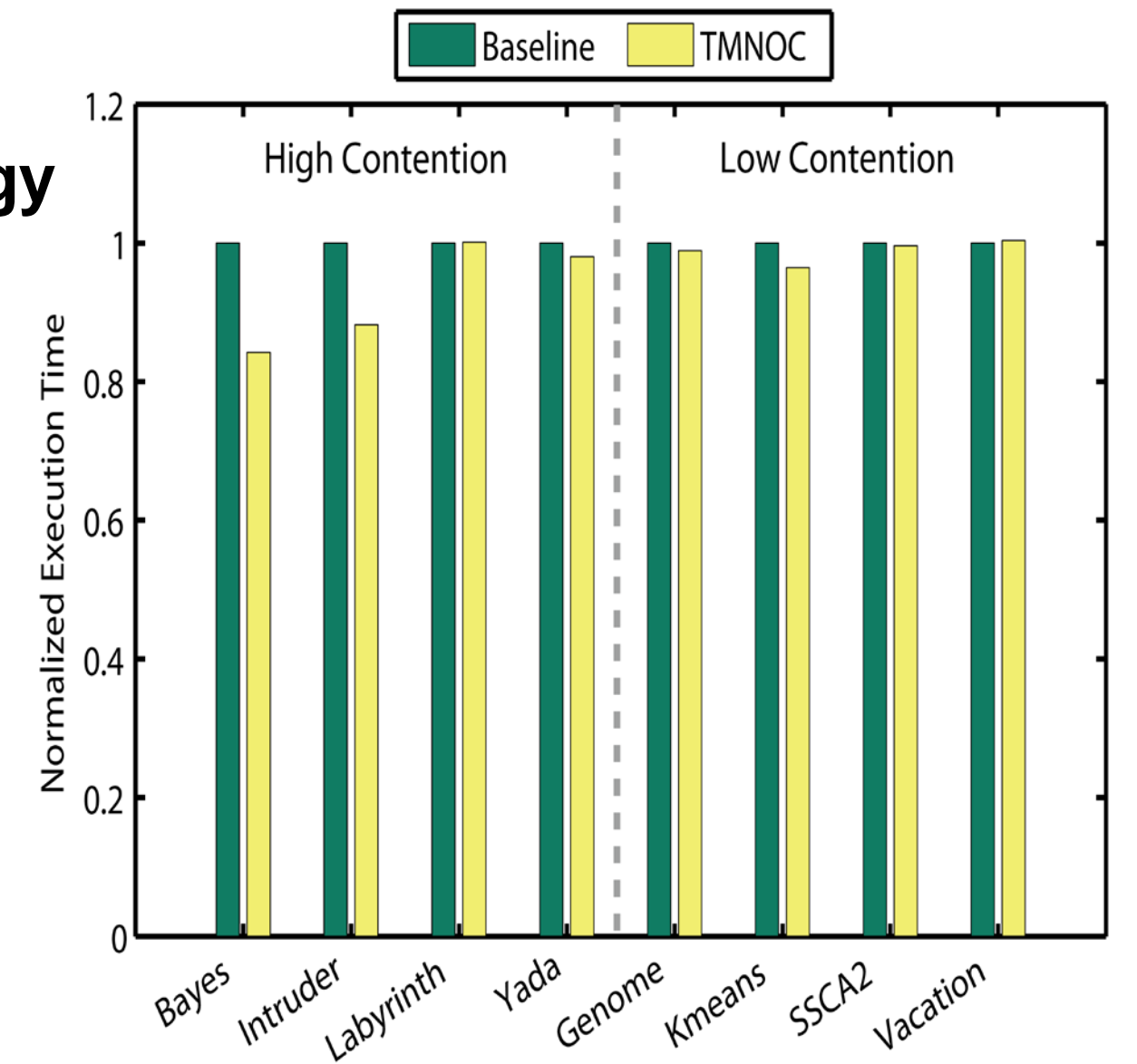


Experimental Results



TMNOC reduces network energy consumption by 15% on average.

- High contention benchmarks (H-C benchmarks) exhibit more significant energy savings (20%) as:
 - H-C benchmarks have much more transactional requests being nacked.
 - Frequent conflicts provide the NoC with sufficient information on conflicts.
- H-C benchmarks show more speedup as:
 - Accesses to shared data are serviced more promptly due to alleviation of directory contention



Performance is not penalized. Achieve 5% improvement