

# The Benefits of General-Purpose On-NIC Memory

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## Data movers are applications that

- (1) are network intensive,
- (2) process message metadata, but
- (3) leave message data unchanged.

## Types of data movers

- (1) Software that processes packet headers but not payload ("NFV")
  - Examples: SW routers, NAT, load balancers, multicast collectives
- (2) Software that associate item key with item data
  - Examples: key-value stores (Memcached, ...), static webservers (Apache, ...)

#### Data movers waste resources

- PCle bandwidth
- LLC space & bandwidth (DDIO)
- Memory bandwidth
- CPU cycles (if mover isn't zero-copy)

### Our idea – eliminate waste with nicmem, the on-NIC memory

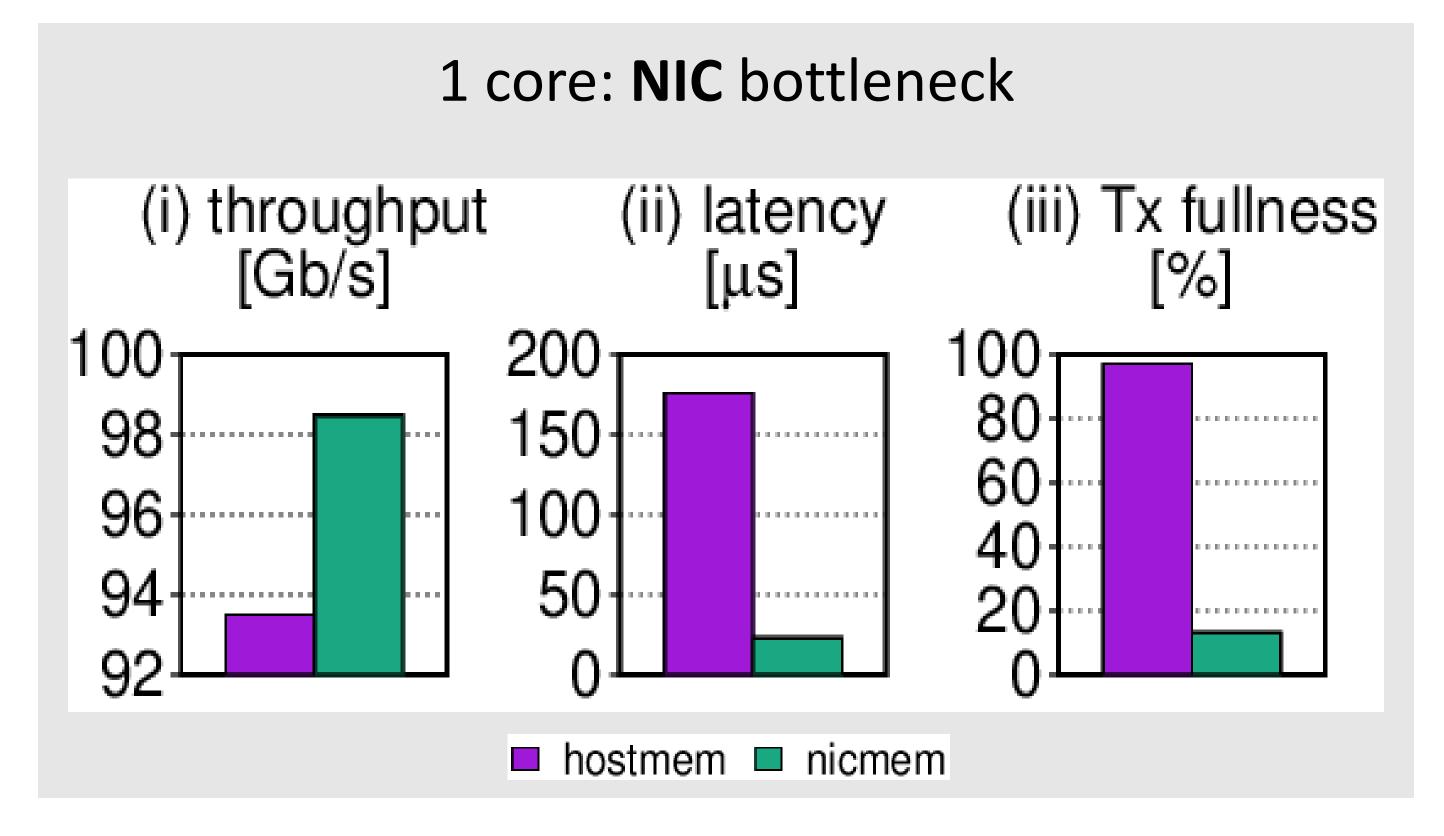
- Internal NIC SRAM used for offloading (RDMA, aRFS, SRIOV, ...)
- Typically underutilized

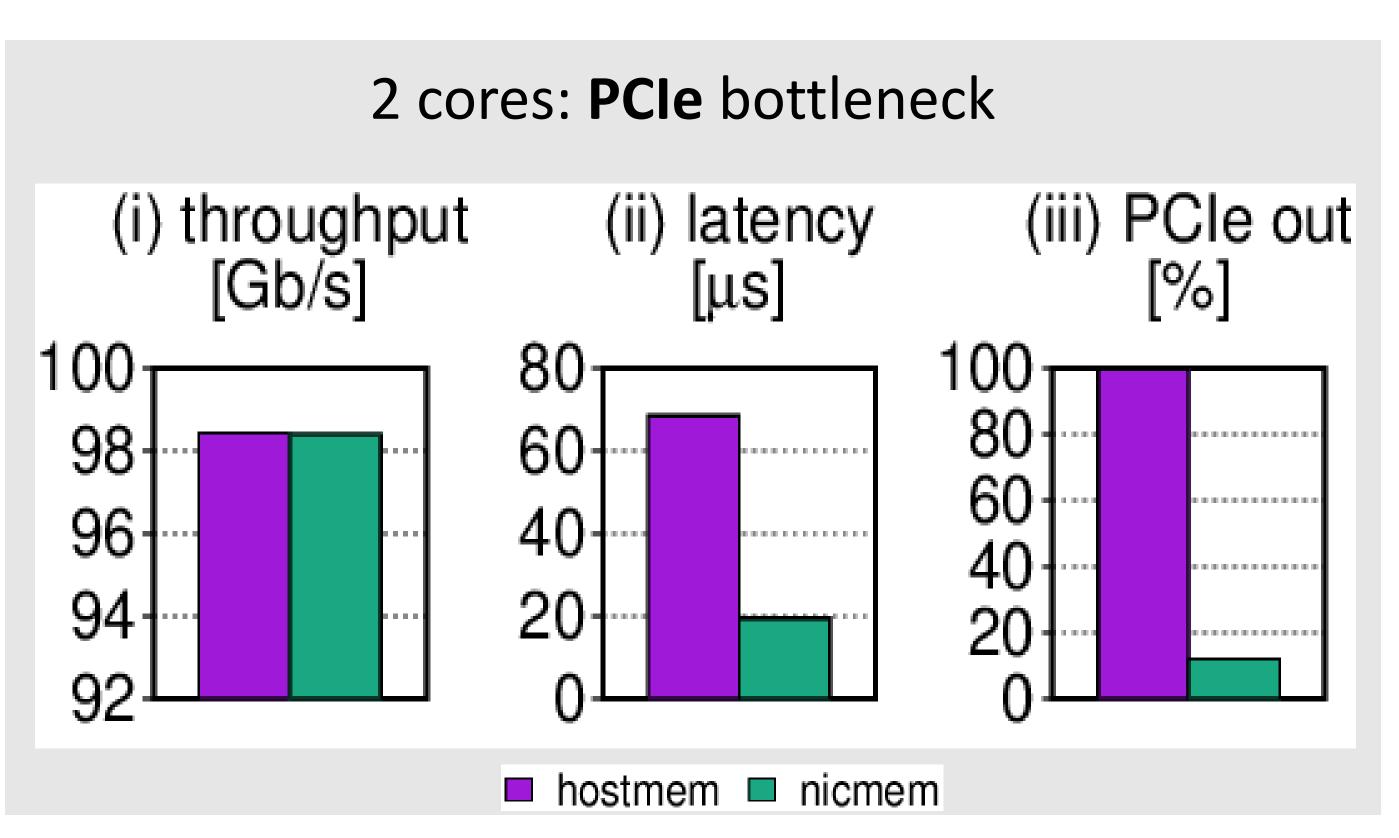
(only 15% used in NVIDIA ConnectX NICs by default)

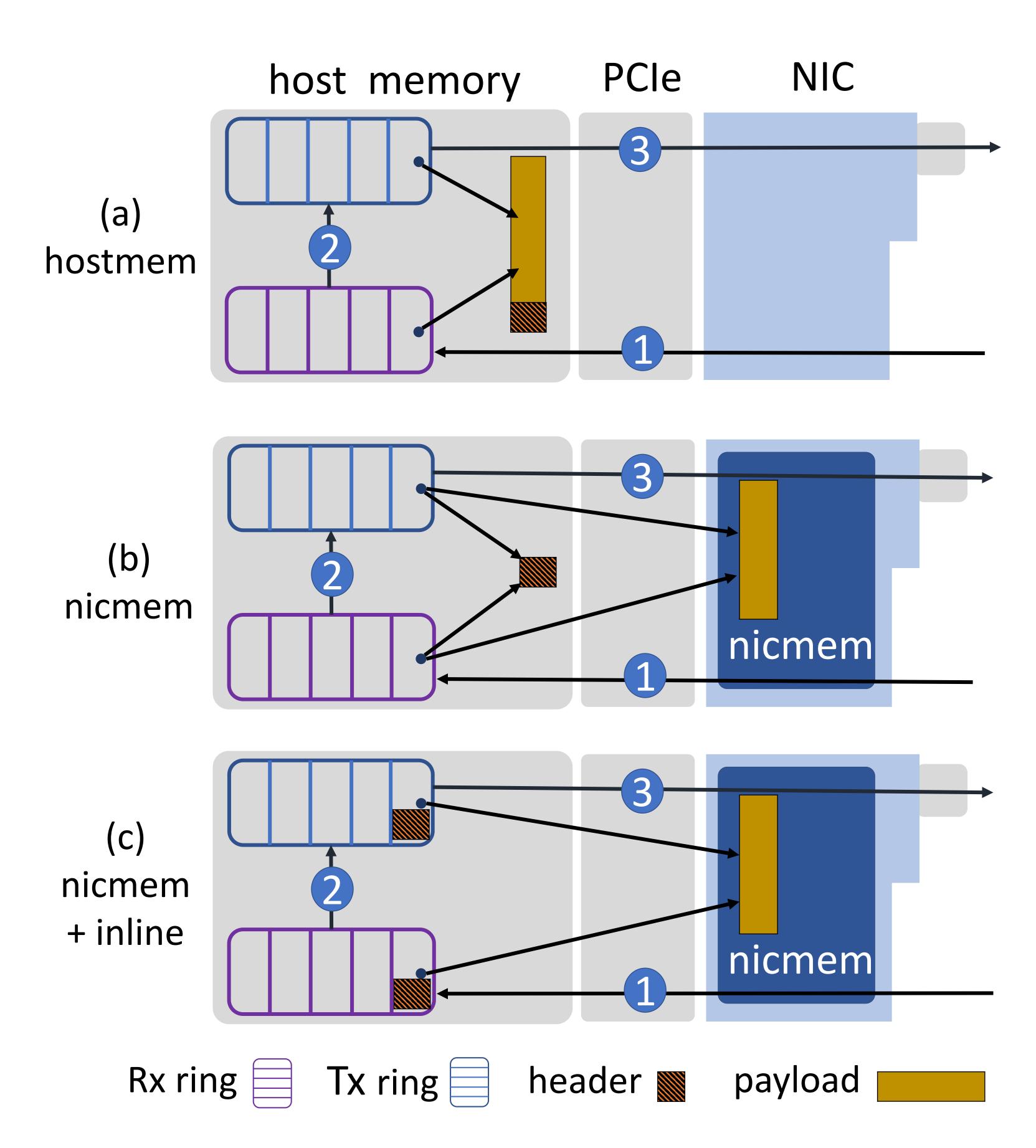
Can easily/cheaply increase its size (~\$0.2 per MB)

## **Specifics**

- (1) Expose unused nicmem to applications, as regular memory, via MMIO
- (2) Split headers & data on receive headers to hostmem & payload to nicmem
- (3) Inline headers use only one descriptor per-packet







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