

CMSC 714

Lecture 9

Ethernet and Infiniband

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Notes

- OpenMP assignment due next Friday
 - don't compile for profiling (with `-pg`) and for OpenMP at same time
 - other questions?

Ethernet

- One of the first, and definitely the most successful, local area network (LAN) protocol and implementation
- Notice that also targeted at multiprocessing, not just distributed computing
- CSMA/CD wire protocol – carrier sense multiple access, with collision detection
 - a shared physical medium, even with repeaters
 - randomized exponential backoff after a collision
 - error detection using checksums on medium, still need end-to-end error detection since whole packets can be lost
- Modern Ethernet protocols are different – for a switched physical medium to scale better
 - original at 3Mb/s (shared), 1Gb/sec (switched) common now, with 10Gb/sec and 100Gb/sec in HPC environments

Infiniband

- Designed to support I/O and network connectivity, from a single PCB to a cluster network to a LAN
 - over copper (twisted pairs) and fiber
- Targeted at cluster networks, SANs, and even embedded systems
 - scalable, and provides RAS – “bandwidth out of the box”
 - idea is to extend the on-processor I/O bus to off-chip network
- Switched point-to-point I/O fabric
 - endpoints (host machines, I/O devices, ...) connect to switches, which route connections to other endpoints
 - link speed from 2.5Gb/sec (1X) to 30GB/sec (12X) by adding more wires – parallel transfers
- Protocols described in terms of standard network layers
 - physical, link, network, transport

Infiniband Layers

- **Physical**
 - defines electrical and mechanical characteristics – cables, connectors, pins, etc.
- **Link**
 - packet layout - management and data
 - switching - uses local IDs in Local Route Header of a packet
 - QoS through Virtual Lanes
 - credit based flow control
 - data integrity – error correction both for each link (VCRC) and end-to-end (ICRC)
- **Network**
 - route packets across subnets – uses IPv6 addresses (128 bits) in Global Route Header of a packet

Infiniband Layers (cont.)

- **Transport**
 - in-order packet delivery – sequence numbers
 - segmenting data into packets
 - channel multiplexing
 - transport services – reliable/unreliable connection/datagram
 - all implemented in hardware