Screencast:
Openib BTL v1.3 Sneak Peak

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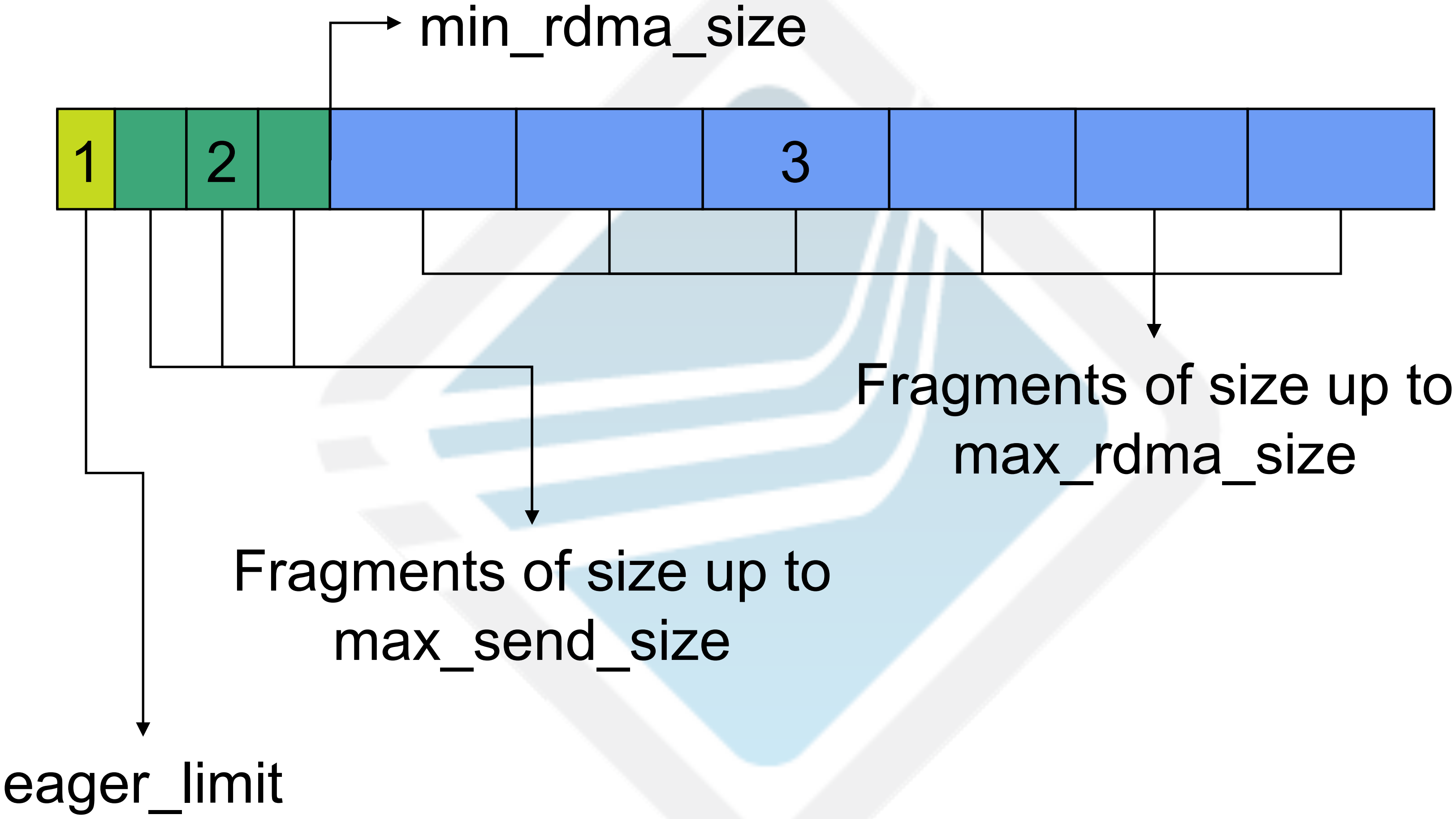
v1.3 Upcoming Features

- This presentation is a “sneak peak”
  - …and is therefore subject to change
  - These slides show what is *likely* to be included
  - **But nothing is definite until v1.3 ships ☺**
- Features shown here are in addition to all the other Goodness coming in v1.3…
  - Performance improvements
  - Tool integration
  - …much more

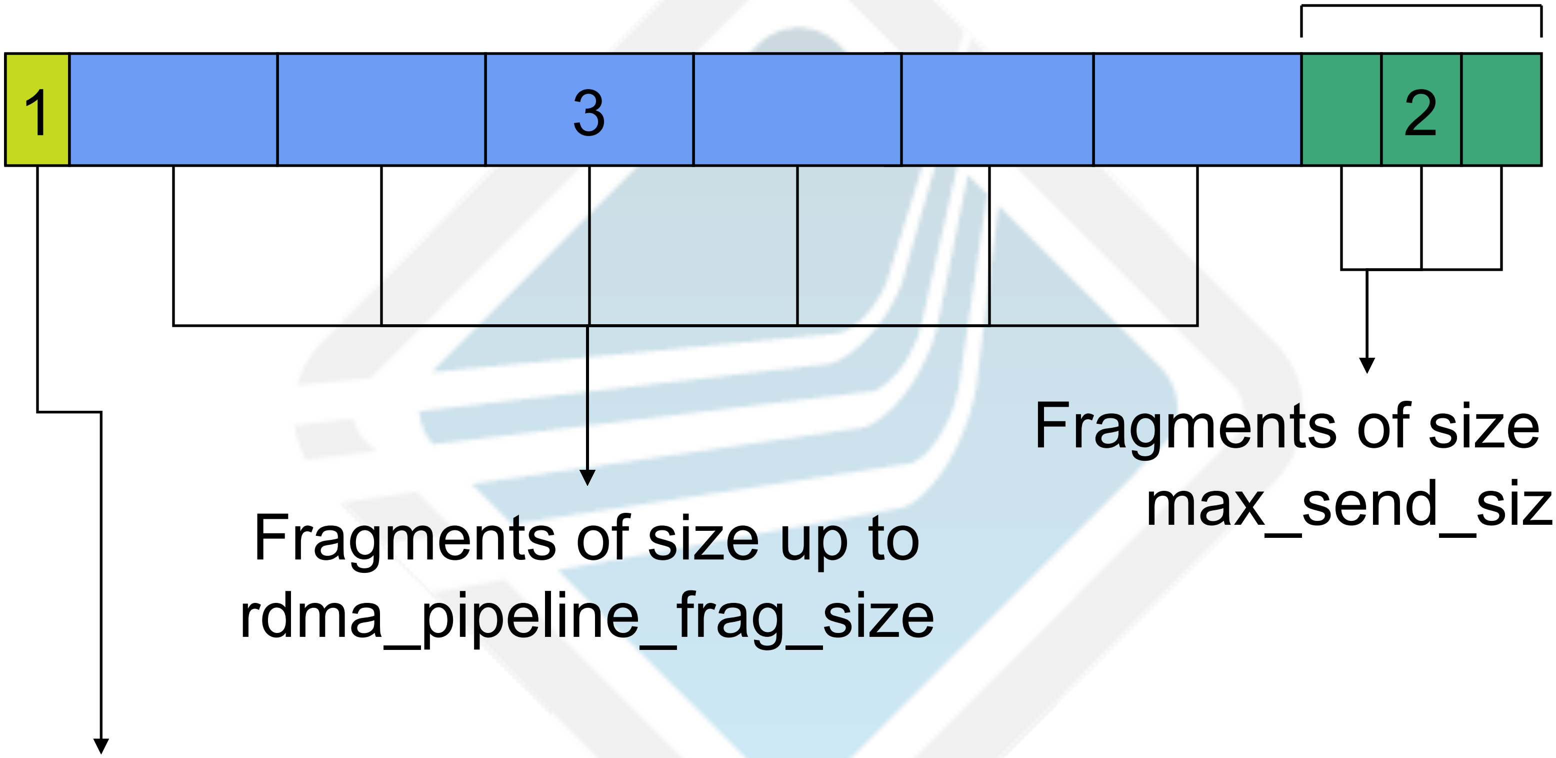
New Hardware Support

- iWARP supported
  - Tested with Chelsio T3 adapters
- Support for Mellanox ConnectX XRC
  - Reduce number of QPs, increase performance
- OpenFabrics Connection Managers
  - RDMA CM: works with both IB and iWARP
  - IB CM: “better” connection wireup over IB

v1.2 Long Message Params


min_rdma_size
1
2
3
Fragments of size up to max_rdma_size
Fragments of size up to max_send_size
eager_limit

v1.3 Long Message Params



rdma_pipeline_send_length

Fragments of size up to max_send_size

Fragments of size up to rdma_pipeline_frag_size

eager_limit

Include / Exclude Interfaces

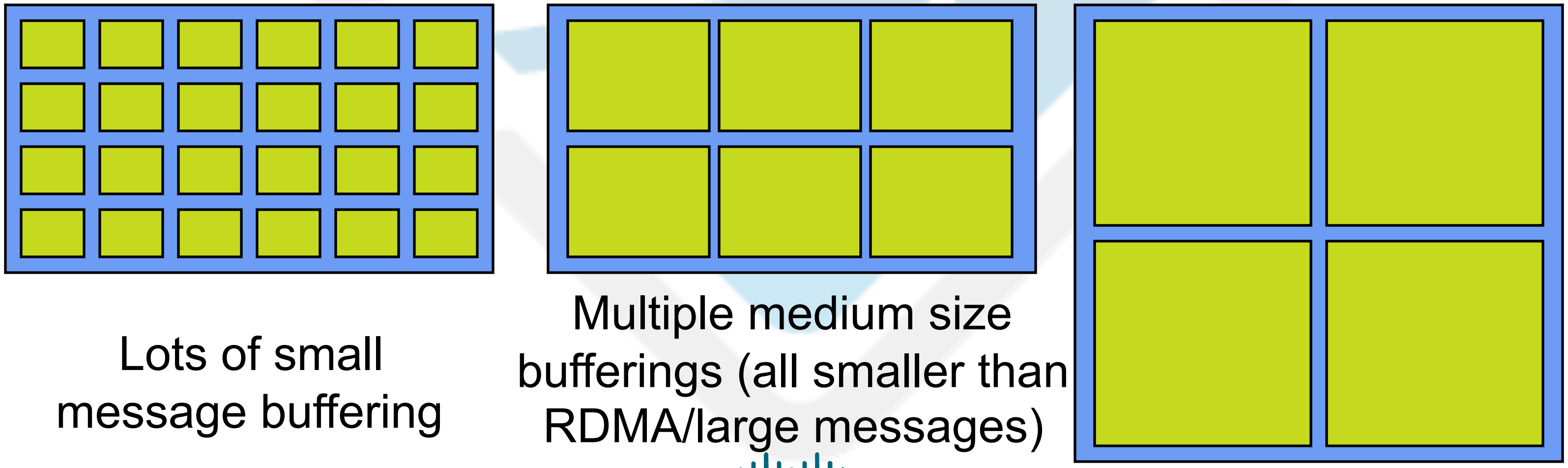
- if_include / if_exclude
  - Comma-delimited list of devices / ports to use or not use

```
mpirun --mca btl_openib_if_include \
    mthca0:1,mthca1 …
```

```
mpirun --mca btl_openib_if_exclude \
    mthca0 …
```

New Receive Queue System: “Bucket” SRQ (BSRQ)

- Based on idea from Cray Portals
  - Different SRQ message sizes allow for much more efficient use of registered memory
  - BSRQ + XRC = fewer QPs, better memory utilization = better performance


Lots of small message buffering
Multiple medium size bufferings (all smaller than RDMA/large messages)

Specifying the BSRQ List

- receive_queues:
  - Comma-delimited list of RQs for each peer
  - Specifying queue sizes and types for “smaller than large” (RDMA) messages
  - Replaces “use_srq” and “rd_num” (and others)
- Default value for some IB HCAs

```
P,128,256,192,128:S,2048,256,128,32:\
   S,12288,256,128,32:S,65536,256,128,32
```

BSRQ Parameter List

- P: Per-peer queues (precious)
  - Size of buffers
  - Number of buffers
  - *Optional:* Low watermark buffer count
  - *Optional:* Credit window size
  - *Optional:* Credit “reserve” buffers
- S: Shared receive queues
  - Size of buffers
  - Number of buffers
  - *Optional:* Low watermark buffer count
  - *Optional:* Max number of outstanding sends

Flow Control

- IB/iWARP are "lossless" networks
  - Must have [hardware] credits to send
  - However, receivers can still be overwhelmed
  - Packets can be dropped due to congestion
  - Or receivers might not be ready (not enough posted receiver buffers)
- Open MPI has software flow control
  - Explicit FC for per-peer receive queues
  - Implicit FC for SRQs (relies on RNR; excellent performance when SRQ not filled)
- Sum of all "reserve" buffers added to smallest PP QP for flow control messages

Small Message Coalescing

- use_message_coalescing:
  - Boolean enabling small message coalescing
- Defaults to 1
  - Only effective if sending many short messages of same MPI signature very rapidly (i.e., faster than HCA can transmit)
  - Some benchmarks show performance gain
  - Only applicable to some real-world apps

NUMA-Aware Device Selection

- In NUMA architectures (e.g., AMD servers)
  - Choose the HCAs / NICs that are “closest”
  - Prevents crossing extra busses
  - Makes the most sense when enabled with processor affinity
- NUMA architecture specified by text config file
  - Can “fake” a NUMA configuration to share devices in high-core count servers

More Information

- Open MPI FAQ
  - General tuning

    http://www.open-mpi.org/faq/?category=tuning
  - OpenFabrics tuning

    http://www.open-mpi.org/faq/?category=openfabrics cisco