Running IB on the Cray XT3

Presented by

Makia Minich

Oak Ridge National Laboratory

US Department of Energy

OAK RIDGE National Laboratory

Questions to answer…

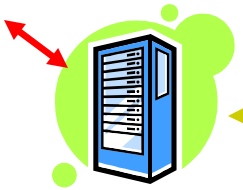
- Why would we want to even do that?
- What exactly are we trying to do here?
- What does it take to make it work?
- What kind of performance can we expect to see?
- What does the future hold?

Why would we want to do this?

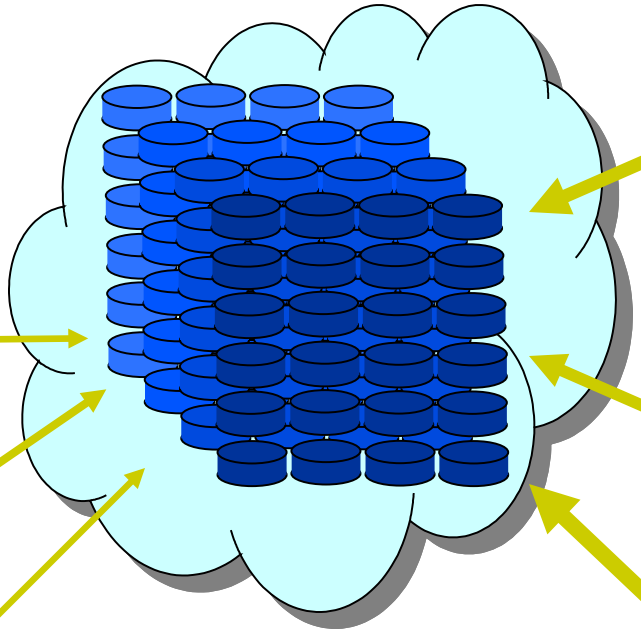
- Lower cost, high bandwidth, low latency solution
- Growing open-source community involvement
- Pretty darn cool thing to do
- Did I mention lower cost?

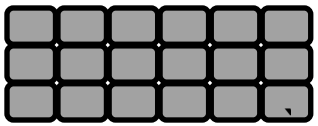
Center-Wide File System (Spider)

Phoenix
Cray X1E



NFS Servers

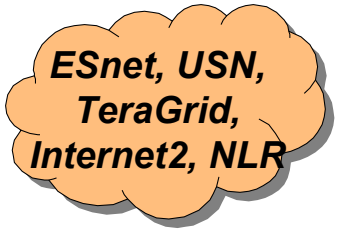




Data Analysis
& Visualization

Jaguar
Cray XT3

HPSS



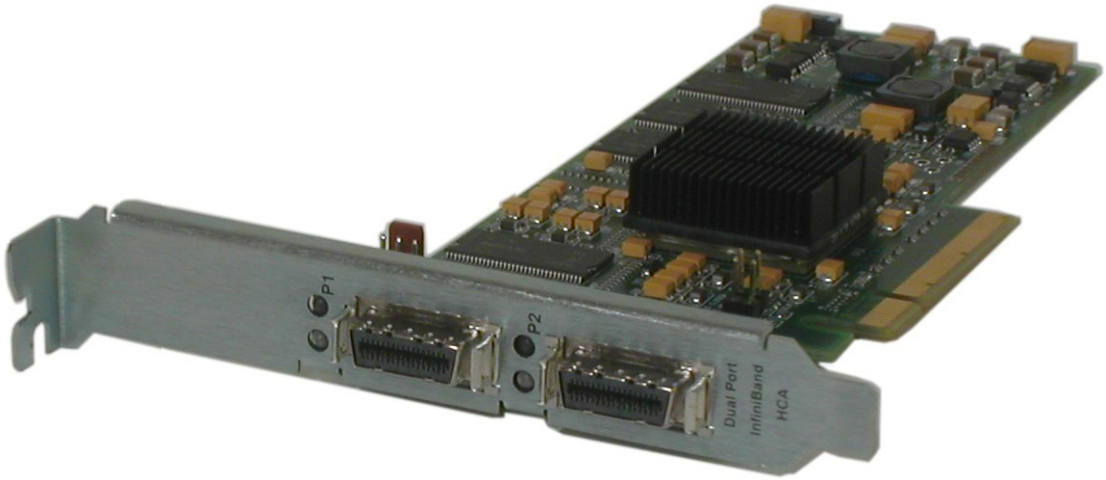
Late 2006
- 200 TB
- 10 GB/s (aggregate)

2008
- 10 PB
- 240s GB/s (aggregate)

Baker

What are we trying to do here?

- Fill the PCI-* slot with an infiniband card
- Bring up the OFED software stack
- Use our new found, high bandwidth, low latency connection.



How do we make it work?

- **Prior to Unicos 1.5:**
  - Need to modify the kernel
  - Export *bad_dma_address* and *dev_change_flags*

```
# Patch to arch/x86_64/kernel/pci-nommu.c
@@ -10,6 +10,9 @@
  * Dummy IO MMU functions
  */

+dma_addr_t bad_dma_address;
+EXPORT_SYMBOL(bad_dma_address);
+
 void *pci_alloc_consistent(struct pci_dev *hwdev, size_t size,
                            dma_addr_t *dma_handle)
 {

# Patch to net/core/dev.c
@@ -3482,10 +3482,7 @@
 #if defined(CONFIG_BRIDGE) || defined(CONFIG_BRIDGE_MODULE)
 EXPORT_SYMBOL(br_handle_frame_hook);
 #endif
-/* for 801q VLAN support */
-#if defined(CONFIG_VLAN_8021Q) ||
defined(CONFIG_VLAN_8021Q_MODULE)
 EXPORT_SYMBOL(dev_change_flags);
-#endif
 #ifdef CONFIG_KMOD
 EXPORT_SYMBOL(dev_load);
 #endif
```

How … continued

- **Need to match gcc versions with the kernel in question**
- **OFED utilities don't like gcc-3.2, so build just the modules**
- **Use separate conf files (they'll save you time)**
  - Invert the example and you will build everything else

```
STACK_PREFIX=/usr/ofed
BUILD_ROOT=/var/tmp/OFED
kernel_ib=y
ib_verbs=y
ib_mthca=y
ib_ipoib=y
ib_ipath=n
ib_sdp=y
ib_rds=n
ib_srp=n
kernel_ib_devel=y
libibverbs=n
libibverbs_devel=n
libibverbs_utils=n
libibcm=n
libibcm_devel=n
libmthca=n
libmthca_devel=n
perftest=n
mstflint=n
libipathverbs=n
libipathverbs_devel=n
ofed_docs=n
ofed_scripts=n
libsdp=n
srptools=n
tvflash=n
libibcommon=n
libibcommon_devel=n
libibmad=n
libibmad_devel=n
libibumad=n
libibumad_devel=n
opensm=n
opensm_devel=n
openib_diags=n
librdmacm=n
librdmacm_devel=n
librdmacm_utils=n
dapl=n
dapl_devel=n
mpi_osu=n
openmpi=n
mpitests=n
ibutils=n
```

How … continued … again

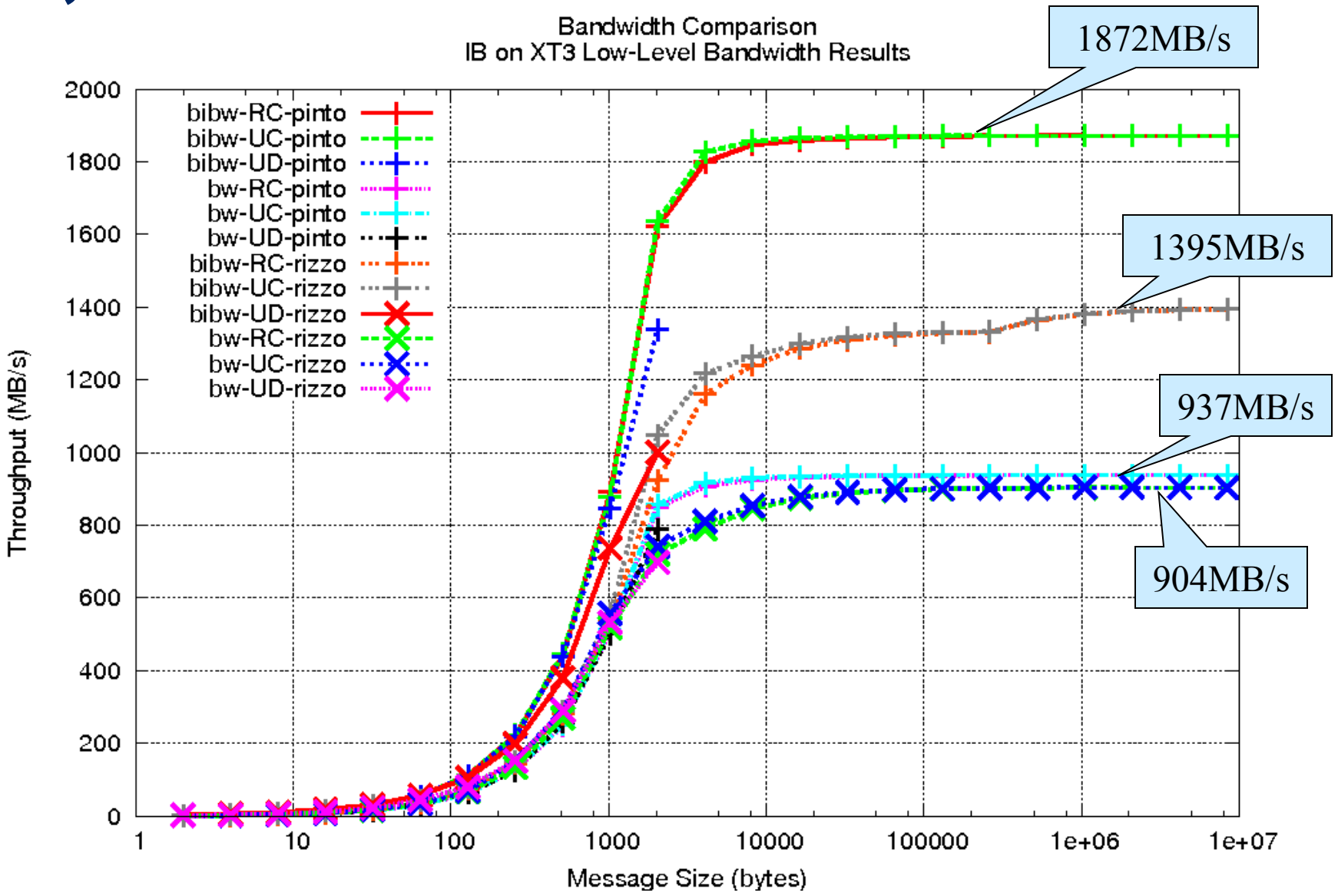
- **Build the stack**
  - Needs to point to kernel headers
  - Unicos <1.5 use your own kernel source code
  - Otherwise, point to /opt/xt-os/default/linux/ss-lustre26
  - Check your kernel version
  - Seem to have good luck building on the SMW

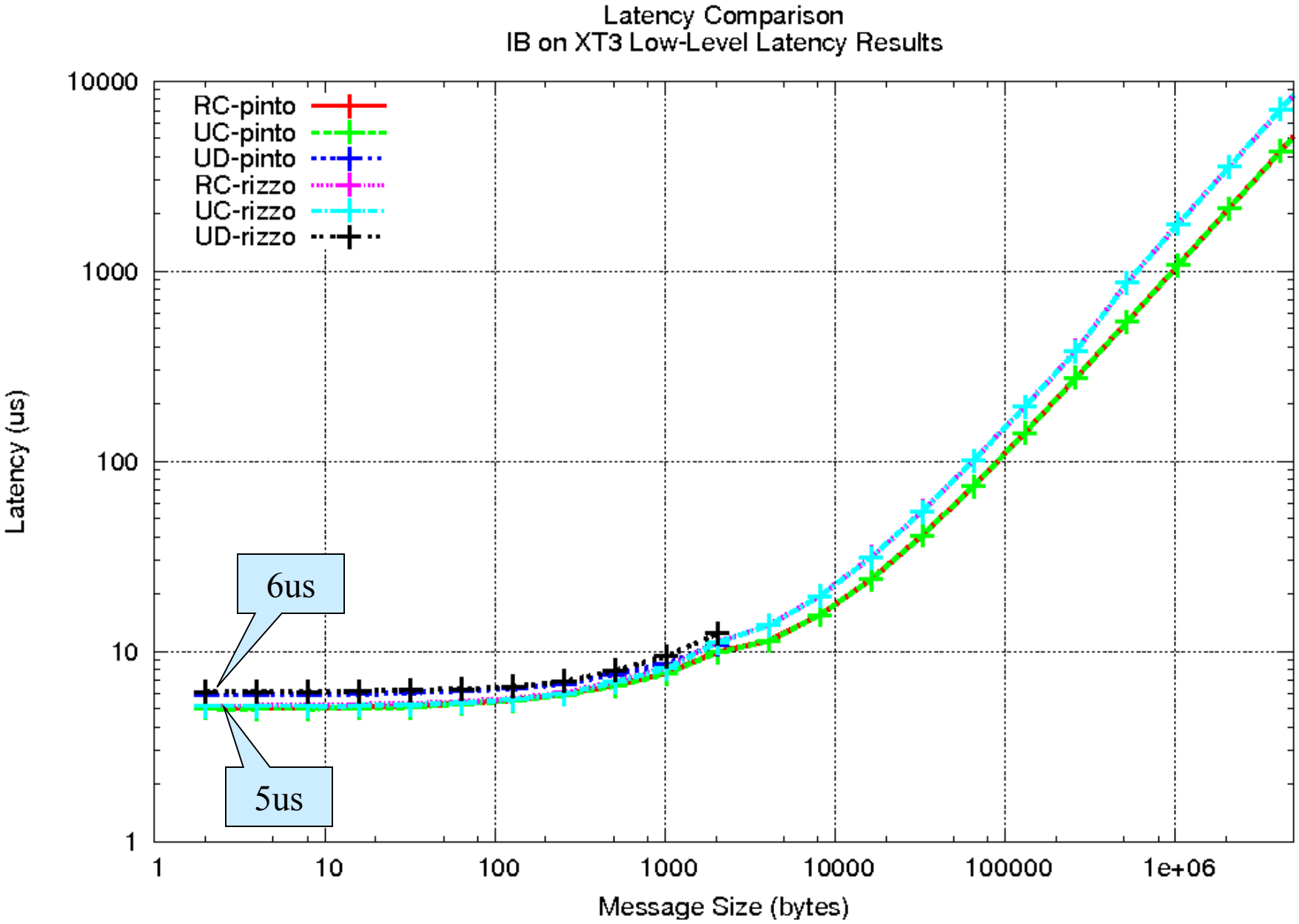
```
# K_SRC=/opt/xt-os/default/linux/ss-lustre26 K_VER=2.6.5-7.283-ss \
./build.sh -c ofed.conf.modules
```

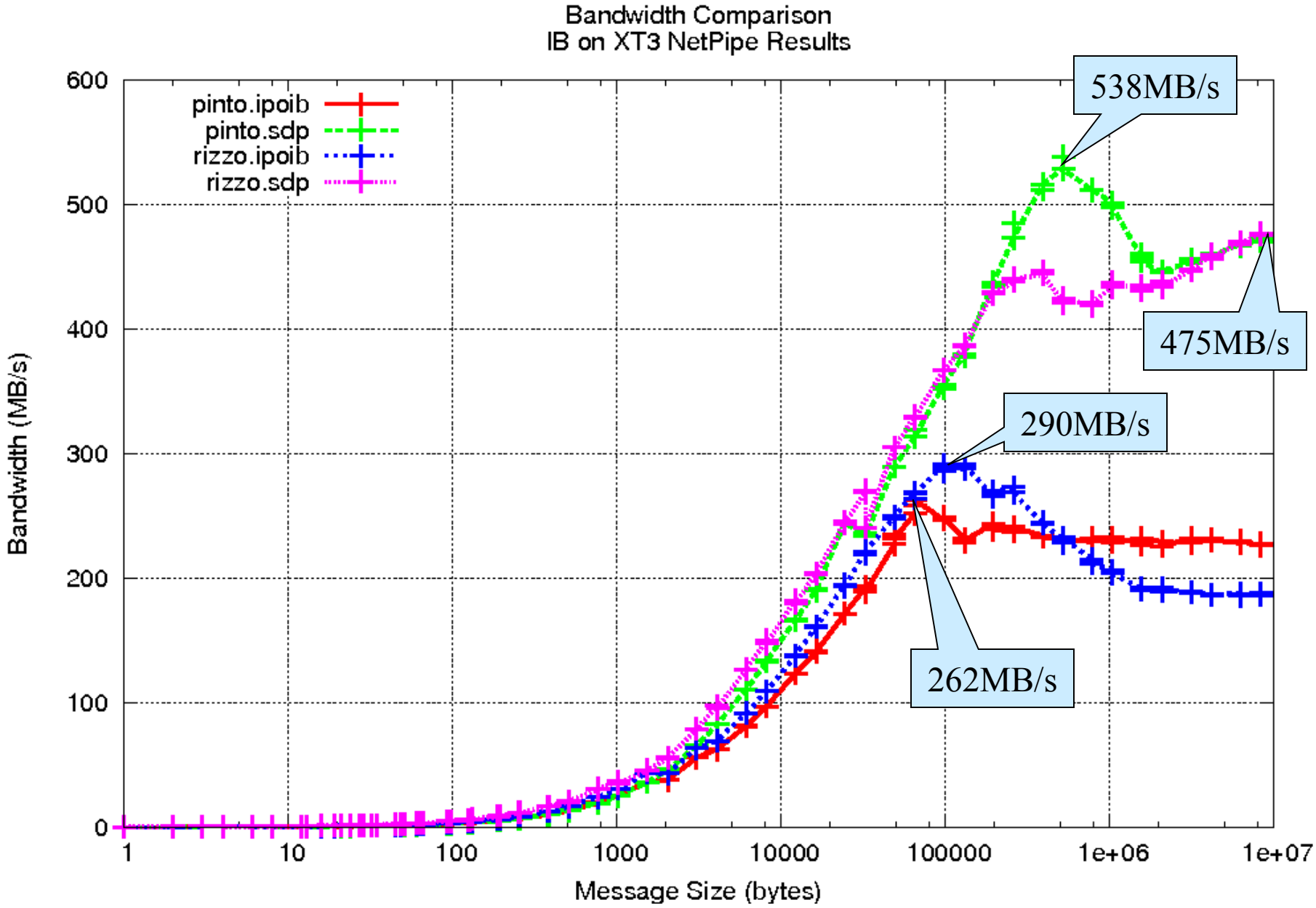
Yup … still continuing

- **Boot your kernel (if you had to build one)**
  - xtcli boot_cfg update -i /tmp/boot/kernel.cpio-1.5.31
  - xtbootsys --reboot c0-0c1s2n3
- **Load your modules on the infiniband node**
  - Fairly large solution set
  - Personally, use /tmp and “mount –bind” tricks
- **Configure your network**

So, what can it do?







What does the future hold?

- Lustre
- NFS over RDMA
- HPSS
- Long range wide-area storage
- Ruling the world

Links/Email

- National Center for Computational Sciences – http://www.nccs.gov
- OpenFabrics – http://www.openfabrics.org
- http://jobs.ornl.gov
- Email: minich@ornl.gov

Any Questions?