



Bootable Cluster CD

NCSI Workshops 2012: Introduction to Parallel Programming

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Sponsors



Sponsors

What is the BCCD?

Short history

What is the problem?

How is BCCD a solution?

Live Demo!

Live Demo! (cont'd)

Boot

GalaxSee - Single node

GalaxSee - Single node (cont'd)

GalaxSee - Multi-node

GalaxSee - Multi-node (cont'd)

Miscellaneous information

Questions (and answers)

- Intel Corporation
- Supercomputing Conference
- Earlham College
- Shodor Foundation
- Contra Costa College

What is the BCCD?



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Miscellaneous information

Questions (and answers)

- A software tool for domain educators for teaching CSE
- A stable platform for the writing of curricula for CSE
- A live CD with pre-configured clustering software
- One part of a larger CSE community

Shodor Foundation

National Computational Sciences Institute (NCSI)

CSE Reference Desk (CSERD)

- “Teaching Parallelism Made Easy”

Just keep pushing “Enter”

Short history



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Questions (and answers)

- First versions developed by Paul Gray and Students at University of Northern Iowa
- Current version (BCCDv3) collaboratively developed by a number of educational institutions
- BCCDv3 much easier to maintain and able to respond to new needs
- BCCDv3 has the same user experience as BCCDv2, so curricula written for v2 will still work with v3

What is the problem?



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Questions (and answers)

- STEM education is more important than ever [?]
- Computers have become a large part of any science curriculum
- BUT ... it's hard to find suitable resources for teaching computational science and parallel programming at scale
- Many schools do not have the resources or expertise to provide the hardware or software
- Those that do tend to provide the resources primarily for research and not for education
- Even with a dedicated educational resource, it tends not to be “hands-on”, and is difficult to see how it works.

How is BCCD a solution?



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Questions (and answers)

- Almost every school will have a computer lab. BCCD is designed to be used on existing systems non-disruptively.
- Many laptops are now dual-core. Virtualization software can be used to setup a cluster right in front of you.
- Regardless of how it's used, BCCD provides an environment that facilitates education.

Live Demo!



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Miscellaneous information

Questions (and answers)

- Double click on Oracle VM VirtualBox.
- Go to New, and click Next
- Type in “BCCD” as the machine name.
- Select “Linux”, then make sure “Debian” is selected
- Enter 1024 MB for the memory.
- Unselect Start-up Disk, and click Continue when prompted.
- Click Create.
- Click Storage.

Live Demo! (cont'd)



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node (cont'd)

GalaxSee - Multi-node
GalaxSee - Multi-node
(cont'd)

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information

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answers)

- Click Empty by the CD symbol, click the CD drop-down on the right, and select Choose.
- Click on the USB stick symbol on the left, and go into SC11Materials.
- Select bccd.iso.
- Go to System, and select Processor, and set the number of processors to 2.
- Go to Network, set NAT to Internal, and set the name to “bccd”.
- Click Ok.

Boot



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GalaxSee - Multi-node (cont'd)

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Questions (and answers)

- Make sure BCCD is selected, and click Start.
- Just keep pressing Enter.



GalaxSee - Single node

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Live Demo! (cont'd)

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GalaxSee - Multi-node

GalaxSee - Multi-node (cont'd)

Miscellaneous information

Questions (and answers)

- In the black terminal window, run `top`

- In the blue terminal window -

```
$ cd $HOME/GalaxSee
```

```
$ hostname > machines
```

```
$ make
```

GalaxSee - Single node (cont'd)



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Questions (and answers)

■ Still in the blue terminal window -

```
$ time mpirun -np 1 ./GalaxSee 500 400 5000
```

```
$ time mpirun -np 2 ./GalaxSee 500 400 5000
```

Notice the number of GalaxSee processes running in the top window

You might not see speedup in VirtualBox, because of virtualization overhead.

GalaxSee - Multi-node



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Questions (and answers)

- Back in VirtualBox, right-click on the BCCD system, and select clone.
- Set the name to BCCD2, click Reinitialize, Next, and then Clone.
- Click Start for BCCD2, and follow the same boot process as the original.



GalaxSee - Multi-node (cont'd)

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Questions (and answers)

```
■ $ module purge && module load modules mpich2
```

```
■ $ make clean && make
```

```
■ $ bccd-snarfhosts
```

```
■ $ bccd-synkdir --ni $HOME/GalaxSee \  
    $HOME/machines
```

```
■ $ time mpirun -np 4 \  
    /tmp/$(hostname -s)-$(whoami)/GalaxSee \  
    500 400 5000
```

■ Notice that not all your processes are shown in the local top window.

■ Once again, speedup is limited by virtualization.

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Questions (and answers)

Where to find documentation? `http://bccd.net`

What software is available? `module avail`

How to load new software? `module load name`

How to unload software? `module unload name`

How to reset networking? `sudo /bin/bccd-reset-network`, use the password you set when you booted

Questions (and answers)



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