# Apex Cluster Manual
## v2.2

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# *Introduction*

## *Welcome*

Thank you for your purchase of an Advanced Clustering Technologies' Apex Cluster!

This manual will provide administrators and users with information required for the management and operation of a computing cluster. Every attempt has been made to provide accurate information and instructions. As each Apex Cluster is custom built and configured the instructions contained within may not be completely accurate. In most instances, deviations from this manual will be noted on the accompanying documentation.

## *Intended Audience*

This manual provides information that will be applicable to system administrator, support technicians and end users, essentially anyone that will access the Apex Cluster.

# Quick Reference

## Contacting Advanced Clustering

Every attempt has been made to provide thorough information in this manual. We realize that not all questions can be anticipated. Fortunately, every Apex Cluster comes with lifetime software support and at least a one year hardware warranty. Longer warranty options are available through your sales representative.

When contacting Advanced Clustering for technical support reasons please have the serial number of the computer or device in question.

We provide many methods for you to contact our technical support specialists.

| | |
|---|---|
| **Email** | support@advancedclustering.com |
| **Web** | http://www.advancedclustering.com/support/ |
| **Phone** | 1 (866) 802-8222 (toll free) |
| **Phone** | 1 (913) 643-0300 Option 2 (outside of North America) |
| **Fax** | 1 (913) 643-0299 |

## Default Passwords

This list includes the default passwords for the item commonly contained within an Apex cluster. For security purposes, these passwords should be changed by the administrator of the Apex Cluster.

| Device | Username | Password | Notes |
|---|---|---|---|
| All nodes | root | cluster | |
| All nodes | act | cluster | Used for testing while being configured |

# *Cluster Overview*

Any time two or more computers are used on one problem it can be described as a cluster. Apex Clusters are High Performance Computing (HPC) clusters. This type of clustering uses multiple computers to work on one problem. When an HPC cluster is created using "off the shelf" hardware and open source software it is sometimes referred to as a Beowulf cluster.

Another common type of clustering is called High Availability (HA). These clusters provide resiliency for applications that need enhanced uptime. These clusters are not addressed in this manual.

# *Node Roles*

The computers that make up a cluster are called nodes. Due to the open nature of HPC clusters there may be many different node types in a single cluster. Most Apex Clusters are comprised of two types of nodes: head nodes and compute nodes. Sometimes head nodes may be referred to as front-end or interactive nodes. These are functionally equivalent to a head node.

## *Head Node*

Most clusters have one head node. This node is used for all user interaction. Software services required for cluster operation originate from the head node but the compute jobs themselves do not typically run on the head node. The common tasks assigned to a head node are:

- User log ins
- Router and firewall to an external network
- Compiling and debugging software
- File serving
- *Queuing* or job scheduler
- Web server for management tools
- InfiniBand Subnet Manager (If the head node has IB)

## *Compute Nodes*

Compute nodes are used for the computational work. Logging in to compute nodes is discouraged as that can interfere with other users' jobs.

Once booted, compute nodes will mount any filesystems shared from the head node and start the execution piece of the queuing system. At this point the compute node is ready to accept and run jobs from the queuing system.

## Network Layout

The cluster communicates on a private network such as 192.168.1.0/24. The head node will provide and additional link to an external network and act as a router, or gateway, to the external network. The use and configuration of the external network interface is site specific. You will need to contact your institution's network administrators for the information required.

Hostname resolution within in the cluster is handled with a distributed *hosts* file. This file is named */etc/hosts* and resides on every node in the cluster. To redistribute the */etc/hosts* file after a change please see the section titled "Using Act_utils" on page 26.

# Shared Filesystems

The head node of the cluster will have at least two filesystems shared with the compute nodes in the cluster. The path to the files contained in these directories is consistent on every node of the cluster.

*/home* will contain each user's home directory. This directory provides a place for each user to store their data and software.

*/act* contains software, documentation and example files installed by Advanced Clustering Technologies. Do not delete this directory as it contains the files needed to recover your cluster in the event of a failure.

# Node Communication

Communication between the nodes in the cluster are handled by `ssh` or `rsh`. Sometimes both are enabled. All nodes allow logins from all other nodes without the need for a password.

# Cluster Hardware

## Unpacking Your Cluster

### Weight Warning

**WARNING: The components of an Apex Cluster can be very heavy. Some pre-assembled clusters are over 2000 lbs. Great care must be used when unpacking and/or moving a cluster or any of its components.**

### Check For Shipping Damage

Despite all attempts at safe and secure packaging, occasionally some packages get damaged during shipping.

**Any suspected shipping damage MUST be reported WITHIN 48 HOURS. After 48 HOURS we will be unable to file any claims with the carrier or the insurer.**

### Tools Required

Installing an Apex Cluster will require the following common tools.

- Box Cutter
- Phillips head screwdriver
- Slot head screwdriver
- Diagonal cutters (also called wire cutters)
- 1/2" wrench or socket
- (Optional) drill or electric screwdriver

### Unpacking A Rack

Unpacking a rack will require a minimum of three people. Do not attempt to unpack a rack alone.

The following tools will be used:

- Box cutter
- 1/2" wrench or socket
- Diagonal cutters

If you have a drill or electric screw driver with a socket attachment, it can be used to remove the bolts securing the rack to the pallet.

Do not discard the pallet or the packaging for the rack. In the event that your Apex cluster may need to

be moved these packing materials are required for the safe transit of the rack.

- Use the box cutter to cut the plastic stretch wrap. Take care to not cut through to the thicker plastic covering placed directly over the rack. Remove the stretch wrap from the rack.
- Remove the cardboard corner protectors.
- Remove the documentation packet from the plastic covering.
- Slide the plastic covering up and off of the rack.
- Open both sets of doors on the rack and cut the zip tie that attaches the key to the inside of the door. Keep these keys in a safe place. The keys are required for the doors and side panels.

# Removing And Attaching Doors And Side Panels

There are some situations that may require the rack doors and/or side panels of the rack to be removed like installing new equipment or reducing weight when moving a rack.

### Removing A Door

- Open door as far as it will open.
- Disconnect the grounding wire on the inside hinge side of the door. There is a spade connector in the middle that should pull apart easily.
- Gently lift up on the door

### Attaching A Door

- Lift the door and place the hinges in matching grooves.
- Lower the door into the holes making sure that all hinges are firmly in position.
- Reconnect the grounding wire by pushing the male end of the spade connector into the female end.

### Removing A Side Panel

- Use the rack keys to unlock the side panel.
- Pull the siding latch directly below the key hole.
- Tilt the side panel away from the rack and lift up to remove.

### Attaching A Side Panel

- Slide the bottom portion of the side panel into the ridge on the rack.
- Tilt the top of the side panel up until it latches securely into the rack.
- Lock the side panel using the key.

# Shock Pallet

**Fully assembled racks can weigh up to 2000 pounds! Use extreme caution unpacking and moving.**

Fully assembled Apex Clusters are shipped on shock pallets. These pallets have a layer of shock

absorbing foam built in to protect the rack, and its contents, from shock and vibration. Also included are ramps to remove the rack from the pallet. If the ramps are missing do not attempt to remove the rack from the pallet by other means; Immediately contact Advanced Clustering (see page 7 for information) to obtain replacement ramps.

- Using the box cutter, carefully cut the plastic stretch wrap and remove it from the rack.
- The ramps are covered in plain cardboard. Remove them from the side of the rack and remove the cardboard.
- Locate the holes on the top surface of the pallet and place the metal tabs of the ramps in to holes. The ramps must be fully inserting and align flush with the top of the pallet.
- There are brackets located along the bottom edge of the rack on the front and back sides. Use the 1/2" wrench or socket to remove the bolts and brackets. Retain these bolts and brackets.
- Do not push the rack from the top, it can tip over! Slowly roll the rack toward the ramps taking care to line the casters up in the middle of the ramp.
- Carefully roll the rack down the ramps.

## Standard Pallet

**A rack with rails and cables can be up to 500 pounds! You will need at least three people to remove a rack from a standard pallet.**

Apex Clusters that are to be assembled on site are shipped on standard packing pallet. The rack will have the sliding rails, cables and other accessories installed.

- To reduce weight remove the doors and side panels. Instructions are located on page 11.
- There are brackets located along the bottom edge of the rack on the front and back sides. Use the 1/2" wrench or socket to remove the bolts and brackets. Retain these bolts and brackets.
- Carefully lift the rack then slide the pallet from underneath.
- Gently place the rack down on the floor.

## Releasing Cables Tied For Shipment

To prevent damage during shipping, some of the pre-installed cables will be bundled up and secured to the rack. These will be attached with black, white, or green zip ties that have not been trimmed. There will be a long "tail" hanging from the zip tie.

To release the cables from the zip tie, use the diagonal cutters to cut the zip tie. Be careful to avoid cutting the cables and cut the zip tie between two cables.

## Unpacking Nodes

Unpacking Apex Cluster nodes will require at least two people. A box cutter will also be required.

Please retain at least one box for each type of node. In the event that warranty service is needed, the original box will be required to protect the node from damage.

- If the nodes are on a pallet they will be covered in plastic stretch wrap. There may also be nylon straps holding the boxes to the pallet. Using a box cutter, carefully cut any straps and remove

the stretch wrap.

- Working with one node at a time, remove a box from the stack on place it on the ground. Cut the tape sealing the box with a box cutter. Take care to not cut too deep.
- Open the inner box.
- Lift the cardboard panel out of the box.
- With one person per side lift the node up and out of the inner box.

# 1U Blade Assembly

NOTE: Installation of the 1U Blade chassis is best performed with two people.

## Installing Blade Housing

- Open the hardware packet. It will contain 10 cage nuts, 8 long screws, and 4 short screws. The 2 rear ears are also shown in this picture.

- Install 2 cage nuts in the rear of the rack. Use the top and bottom holes in the rack space



- Install 2 cage nuts in the front of the rack

- Attach the rear ear to the cage nuts using the long screws. Please note the orientation of the ear in the photo. The protruding mounting hole should be placed toward the top.



- This picture provides another view of the rear ear.



- Remove both blades from the outer housing.

- Slide the outer housing into the rack and align the rear ears with the channels in the housing. Continue to support the front of the housing.

- Secure the front of the outer housing using 2 screws per side.

## Inserting a Blade

- Pay careful attention to the fans while inserting the blade. The vibration reducing mounting of the fans can cause then to catch on the housing.
- Line up the blade with the opening in the outer housing.
- Gently slide the blade fully into the housing.

## Removing a Blade

- Remove all cables connected to the back of the blade. Power, Ethernet, and InfinBand cables could be connected and could be damaged.
- Grab both front latches and squeeze them toward the middle of the blade.
- While still squeezing the latches, gently pull the blade out of the housing.

# *1U Rail Assembly*

NOTE: These instructions are for the rails supplied with 1U chassis beginning in March 2008. These rails are identified by a purple latch on the piece attached to the computer.

- Open the hardware packet. It will contain 10 cage nuts, 8 long screws, and 4 short screws. The 2 rear ears are also shown in this picture.



- The front piece of the rail is on the computer.



- Fully extend the front rail piece on the computer.



- Press the purple release tab down to release the front rail piece.



- Remove the front rail piece from the computer.
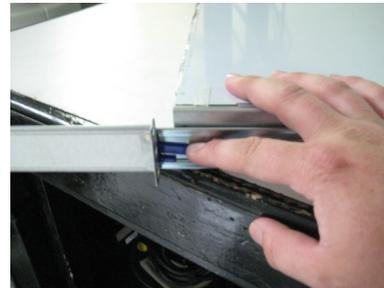
- Install 2 cage nuts in the rear of the rack. Use the top and bottom holes in the rack space.

- Install 3 cage nuts in the front of the rack.

- Attach the rear ear to the cage nuts using the long screws. Please note the orientation of the ear in the photo. The protruding mounting hole should be placed toward the top.