From: Craig Dunwoody <cdunwoody@graphstream.com>
Date: February 6, 2005 3:27:16 PM EST
To: welch@cs.unc.edu, herman@cs.unc.edu
Cc: info@graphstream.com
Subject: Corrected GraphStream system release notes v20050206.0

Hello Greg and Herman,

I just noticed a small but important typo in the GraphStream system release notes v20050203.0 that I sent you earlier. The CPUs were incorrectly listed as AMD OSA246 (2.0GHz). The CPUs in the system are actually AMD OSA250 (2.4GHz; the fastest currently available), per the system spec.

I have included at the end of this email an updated v20050206.0 that corrects this error.

Sincerely,
Craig Dunwoody
cdunwoody@graphstream.com
650-906-8261 (cell)

Document name
Release notes for GraphStream 010.UNC computer system

Document version
20050206.0

Document installation locations
Windows
C:\master\010.unc20050203.0\relnotes_20050203.0.txt
Linux
/master/010.unc20050203.0/relnotes_20050203.0.txt

Document revision history

20050206.0

Fixed incorrect CPU model designation. Correct designation is OSA250, not OSA246.

Fixed minor typos.

20050203.0

Initial version.

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Contents

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1. *** READ THIS FIRST ***

HDDs, software, and documentation shipped separately

The following items were NOT included in the main system shipment, and were shipped separately:

10 HDDs, each with pre-installed software and mounted in hot-swap sled
1 GraphStream 010.unc_20050203.0 software/doc CD
1 Tyan mainboard BIOS v2.02 auto-flash floppy
1 Silicon Image Windows RAID driver floppy v20050203.0
1 Silicon Image Linux RAID driver floppy v20050203.0

Caster installation

System was shipped with the four removable casters detached and stowed at top of cardboard shipping box. To install casters:

- Carefully place entire system on its side, to provide access to aluminum mounting channels for casters on bottom of case.

- For each caster, push in on spring-loaded retention button at end of mounting channel, drop caster's mounting plate into central cut-away section of mounting channel, and slide caster into position.

Opening front and rear doors

Each door has 3 latches: 1 lockable, 2 non-lockable.
System was shipped with lockable latches unlocked.

Each door has compound hinge that allows door to open 270 degrees and lie flat against side of case.

To significantly reduce bulk of system when it is not in transit, each door can also be removed very quickly and easily, by lifting door vertically until hinge pins disengage from sockets.

Power connection

System requires two NEMA 5-20R 120V 20A receptacles for operation.
System was shipped with PDU input cords stowed at top rear.

KVM console connection

System was shipped with KVM console cable stowed at top rear.

KVM switch operation

KVM switch was shipped with blank username and password. On power-up, unit will prompt at the console for username and password. Simply press the <Enter> key twice.

As documented in the supplied user manual, KVM switching is controlled via console keyboard and display. Press the <Scroll Lock> key TWICE to bring up a menu of cluster nodes, use the <Up Arrow> and <Down Arrow> keys to select the desired node, then press the <Enter> key.

Required BIOS settings change

Due to a change in RAID configuration of HDDs that was made after system was shipped, it is necessary to change a mainboard BIOS configuration setting on each node before that node is booted for the first time.

*** If this change is NOT made, the nodes will NOT boot! ***

To make the required BIOS configuration change:

DEL key during Power-On-Self-Test (POST) to enter mainboard BIOS Setup
Advanced tab
Device & PCI Slots Configuration
Onboard Serial ATA Mode
Raid *** NOTE: system was shipped with a different setting ***
Exit tab
Save Changes and Exit
DEL key during Power-On-Self-Test (POST) to enter mainboard BIOS Setup
Boot tab
Boot Device Priority
1st Boot Device
03:58-0 SiI RAID0
2nd Boot Device
Pioneer DVD-RW (master node 3DMC-1 only)
MBA v6.2.11 Slot 0 (camera nodes)
Exit tab
Save Changes and Exit

HDD installation

Each HDD is pre-mounted in a hot-swap sled that is labeled clearly with a node ID (H01 - H05) on the top, and a slot ID (0 or 1) on the latch handle.

Since software is pre-installed, it is obviously critically important to install each HDD exactly according to its node/sled ID labels.

Install each HDD as follows:

- Be careful to observe proper ESD-control procedures. Before inserting HDD, touch outer case of HDD and rackmount frame on system, to equalize potentials and avoid static discharge.

- Release spring-loaded latch handle by pushing on red release lever.

- Insert sled into appropriate slot. Some stiffness during insertion is normal, but if the sled seems to not be aligned properly with the guide channels in the slot, pull sled out and try again.

- Carefully push down on latch handle until it clicks into locking mechanism.

Pre-installed, pre-configured operating systems

Microsoft Windows XP Professional Service Pack 2 (WXPproSP2)
Red Hat Enterprise Linux WS v3.0 Update 3 X86_64 (RHWS3U3_64)

Boot configuration

Each node uses the GRUB bootloader from RHWS3U3_64 to provide a boot menu:
WXPproSP2 (default)
RHWS3U3_64

RHWS3U3_64 boot-time warning messages

During RHWS3U3_64 boot, the depmod utility outputs warning messages about unresolved symbols in Serial ATA controller driver kernel modules. This is a side effect of the installation of the Silicon Image Serial ATA controller driver, and can be safely ignored.

Console monitor configuration

System was shipped with WXPproSP2 and RHWSU3_64 each pre-configured to drive console monitor at 1280x1024@60Hz, suitable for a LCD monitor.

Pre-configured login accounts

Windows
username:administrator

password:3dmc

Linux
username:root
password:3dmc

Single-system-image Linux cluster administration

GraphStream works with two similar packages for single-system-image Linux cluster administration:

OneSIS
onesis.sf.net
Warewulf
www.warewulf-cluster.org

Each of these packages is a lightweight Open Source overlay on top of a single Linux OS installation on the master node. As such, either of these packages can be incrementally added to the system at any time after initial bringup.

GraphStream is looking forward to working with UNC to configure one of these packages on the 010.UNC system. We have chosen to not include this capability in the initial software installation, for two reasons:

- Each of the packages is about to have a major new release, with many significant improvements. Given that the new releases are expected to be significantly simpler to set up, and considering that it will take some time for UNC's applications to migrate fully to Linux, we believe that the value of pre-installing a soon-to-be-obsolete release of one of these packages is limited at best.

- Each of the packages can require some adjustments in the installation of certain application software, which can in some cases make the task of initial bringup more complex.

Accessing node internal components

- Be careful to observe proper ESD-control procedures. Before and during any work on node internal components, touch node chassis to ground yourself and avoid static discharge.

- Disconnect all cables at rear of node.

- Remove two black front panel rackmount screws.

- Loosen two silver front panel rackmount thumbscrews.

  NOTE: it can be difficult to re-engage and tighten these thumbscrews, because their design fundamentally requires very precise alignment between node chassis and rackmount frame. If you have trouble with this, try using the front-panel grab handles to firmly pull upward on the chassis while re-engaging the thumbscrew. During final assembly, GraphStream was able to get all of the thumbscrews engaged, but we were not able to fully tighten all of them.

- Carefully slide node forward until the sliding rails are extended fully.

- Most internal maintenance on nodes can be performed with the node fully extended from the system on its sliding rails.

  If the node needs to be removed completely from the system, push on black plastic release clips on outer edge of left and right inner rails (push up on left-side clip, down on right-side clip) while pulling node forward, until inner rails disengage from outer rails.

- Release and remove node top cover. After a bit of practice, doing this is quite easy. One approach that works for us:

  - Stand on right side of fully extended node.

- While using left hand thumb and middle finger to firmly press down simultaneously on two latch release buttons at front of top cover, curl right-hand fingers up under rear lip of top cover, above PCI slots. Use right hand to pull top cover rearward until it disengages from latches at front, then lift top cover off of node.

- If access to CPU and/or memory components is needed:

  - Remove two hot-swap rear exhaust fans. For each fan, push sideways on plastic retention clip and pull upward on handle.

    NOTE: When later replacing these fans, be careful to put each fan back into the slot that it was removed from. The fan on the left (nearest to the PCI slots) has a special cut-out on the bottom edge that is necessary for clearance above the mainboard's audio-connector header. If you accidentally swap the left and right fans when replacing them, the fans and top cover will not fit properly.

  - Lift and remove the plastic air shroud that covers the CPU heatsinks and memory DIMMs.

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2. Hardware configuration details

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1 Ziploc bag (B1) containing printed documentation and software
Shipped at bottom of sway area inside cabinet on left side

1 Ziploc bag (B2) containing cables and connectors
Shipped at bottom of sway area inside cabinet on right side

1 SKB 3SKB-R16U24 rackmount case
www.skbcases.com/industrial/product/shocks/shock1.html

Exterior dimensions
36.75"W x 27"D x 39"H

Weight
Empty
110 lbs
Loaded with all system components
Approx. 420 lbs

1 internal 16RU rackmount frame, mounted on 16 shock absorbers

3SKB-R16U24 default configuration includes 8 shock absorbers. 8 additional shock absorbers were installed, to safely accommodate weight of included components.

2 doors (front and rear), each with 270 degree compound hinge

2 keys for lockable latches (in bag B2)

4 removable casters, each with integrated brake mechanism

1 D-Link DGS-1008TL Ethernet switch
www.dlink.com/products/?sec=0&pid=238
1 user manual (in bag B1)
Unit labeled "ES1", mounted at top front of system unit

5 Arrow Micro CC5E-B7B CAT5E cables
www.arrowmicro.com/PC_Peripheral.htm
Each cable labeled on each end with unit/port IDs for both ends

1 Aten CS-1208A KVM switch
www.aten.com/02-p-item.php?id=577
1 rack mounting kit
1 power adapter (DC9V, 1.2A)
1 firmware upgrade cable (in bag B2)
1 user manual (in bag B1)
Unit labeled "KS1", mounted at top rear of system unit

5 Aten 2L-5202P KVM switch-to-node cables
www.aten.com/02-p-item.php?id=569
Each cable labeled on each end with unit/port IDs for both ends

1 Ultima 15' desktop extension cable
www.cablestogo.com/product.asp?cat%5Fid=905&sku=29635
Used to connect KVM switch console output to monitor/keyboard/mouse
Cable labeled on each end with unit/port IDs for both ends
2 threaded hex cable coupler standoffs (in bag B2)

1 HD15 M/M gender changer
www.cablestogo.com/product.asp?cat%5Fid=1709&sku=02752
Mounted on end of KVM console cable, for direct connection to monitor

After this item was purchased, the supplier added a new, much
more compact version that might be more suitable for this
application, if the supplied unit causes mechanical interference
with the monitor being used:
www.cablestogo.com/product.asp?cat%5Fid=1701&sku=20686

1 Pioneer DVR-SK12D DVD/CD read/write optical drive
www.pioneerelectronics.com/
pna/product/detail/0,,2076_17573091_23143977,00.html
1 power adapter
1 user manual (in bag B1)
Unit labeled "OD1", mounted at top front of system unit

1 Belkin F3U138-06 USB cable
catalog.belkin.com/
IWCatProductPage.process?Merchant_Id=&Product_Id=128031
Can be used to connect OD1 to rear USB port on any cluster node
Cable labeled on each end
System shipped with OD1 connected to master node

1 "master" cluster node
Unit labeled "H01" on front and rear

1 Supermicro SC833T-550B chassis
www.supermicro.com/products/chassis/3U/833/SC833T-550.cfm
1 user manual (in bag B1)
GraphStream custom modifications to accommodate Opteron mainboard

2 Western Digital WD2500SD HDDs
www.westerndigital.com/en/products/Products.asp?DriveID=87
Each HDD mounted in hot-swap sled
*** NOTE: HDDs shipped separately from system ***

1 Tyan S2885ANRF mainboard
www.tyan.com/products/html/thunderk8w.html

Provided by Tyan and shipped with system:
1 user manual v1.01 (in bag B1)
1 quick reference card v1.01 (in bag B1)
1 driver CD vM2.0 (in bag B1)
NOT used for software pre-install
1 Silicon Image Windows IDE driver floppy v1.2.0.5 (bag B1)
NOT used for software pre-install
1 Silicon Image Windows RAID driver floppy v1.0.0.1 (bag B1)
NOT used for software pre-install

Silicon Image 3114 RAID controller on Tyan S2885 mainboard
provides four Serial ATA ports. The system was shipped
with these ports connected to HDD hot-swap backplane as
follows:

HDD slot #0: Mainboard SATA port #1
HDD slot #1: Mainboard SATA port #2
HDD slot #2: Mainboard SATA port #3
HDD slot #3: Mainboard SATA port #4
HDD slot #4: <no SATA connection>
HDD slot #5: <no SATA connection>
HDD slot #6: <no SATA connection>
HDD slot #7: <no SATA connection>

2 AMD OSA250 CPUs
www.amd.com/opteron

2 GraphStream custom passive CPU coolers

4 Corsair CM72SD1024RLP-3200 DIMMs
www.corsairmemory.com/corsair/servers.html#rddr

1 Sapphire Radeon X800XT GPU
www.sapphiretech.com/vga/x800-xt.asp
1 Sapphire/ATI installation driver CD v12-020 (in bag B1)
NOT used for software pre-install
1 CyberLink PowerDVD 5 CD (in bag B1)
NOT used for software pre-install
1 DVI-HD15 adapter (in bag B2)

1 Intel PWLA8492MT NIC
www.intel.com/
network/connectivity/products/pro1000mt_dual_server_adapter.htm

1 Vantec Nexus NXP-205-BK 4-channel cooling fan speed controller
www.vantecusa.com/product-peripheral.html#

4 rotary potentiometers, each controlling speed of one cooling fan:
Channel1: mid-chassis 9cm fan (left) for GPU
Channel2: mid-chassis 9cm fan (center-left) for CPUs, GPU
Channel3: mid-chassis 9cm fan (center-right) for CPUs
Channel4: mid-chassis 9cm fan (right) for PSU, CPUs

System shipped with all channels at minimum setting, which provides adequate cooling and is ideal for situations when people will be working near the system and it is desirable to minimize cooling fan noise.

In situations when people will NOT be working near the system, it might be desirable to adjust cooling fan speeds higher, because doing so can reduce component temperatures by an additional several degC, which generally tends to be good for component longevity.

GraphStream generally prefers automatic temperature-controlled mechanisms for cooling fan speed control, not manual fan speed controls. In this system, the mainboard contains circuitry and firmware for temperature-based speed control of the two 8cm rear CPU cooling fans, but does not have the capability of providing such control for the four mid-chassis 9cm cooling fans. We have not yet found a standard mainboard that supports Opteron CPUs and also is capable of providing temperature-based speed control for all six of the chassis cooling fans in the Supermicro SC833-550B chassis.

4 "camera" cluster nodes
Units labeled "H02" through "H05" on front and rear
Configuration of each camera node identical to master node, EXCEPT:

Remove
4 Corsair CM72SD1024RLP-3200 DIMMs

1 Intel PWLA8492MT Ethernet NIC

Add
4 Corsair CM72SD512RLP-3200 DIMMs
www.corsairmemory.com/corsair/servers.html#rddr

1 SIIG FireWire 800 M-64 interface card
www.siig.com/product.asp?pid=380
1 user manual (in bag B1)
1 FireWire 800 Host driver CD v1.1 (in bag B1)
NOT used for software pre-install

1 SIIG FireWire 800 9-6 Adapter (in bag B2)
www.siig.com/product.asp?pid=3

1 SIIG FireWire 800 9-9 Cable (in bag B2)
www.siig.com/product.asp?pid=4

2 APC AP9563 PDUs
www.apcc.com/resource/include/techspec_index.cfm?base_sku=AP9563
2 GraphStream-customized brackets for integration with 3SKB-16U24
1 user manual (in bag B1)
Unit labeled "PS1" mounted at top rear of system unit, powering:
ES1
KS1
OD1
H01
H02
Unit labeled "PS2" mounted at bottom rear of system unit, powering:
H03
H04
H05
12' input cords for PS1 and PS2 each end in NEMA 5-20P plugs

6 Belkin F3A104-06-RFP 6' AC power cords
catalog.belkin.com/
IWCatProductPage.process?Merchant_Id=&Product_Id=16248
Rotating flat NEMA 5-15P plug for space-constrained application

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3. Software configuration details

Software pre-installed and pre-configured by GraphStream

Software pre-installation involves a large number of configuration choices. GraphStream has attempted to make these choices in a way that will be appropriate for the customer site, but we do expect that some adjustments will need to be made to the software configuration during on-site sytem bringup. GraphStream is happy to work with our customers to make these adjustments.

OS CDs are NOT included with system, based on GraphStream's understanding that UNC already has the required OS CDs and license keys.

Microsoft Windows XP Professional Service Pack 2 (WXPproSP2)
www.microsoft.com/windows

Microsoft post-WXPproSP2 updates (installation current as of 2005/02/03)
www.microsoft.com/windowsupdate

Red Hat Enterprise Linux WS v3.0 Update 3 X86_64 (RHWS3U3_64)
www.redhat.com/software/rhel/ws/

010.unc_20050203.0 software/doc CD

Contains latest releases (as of 2005/02/03) of the following components:

relnotes_20050203.0.txt
GraphStream 010.UNC system release notes, v20050203.0

amd_8000/wxp/AMDDrv210.exe
AMD Windows Driver Pack for AMD8000 chipset on Tyan S2885, v2.10
ftp://ftp.tyan.com/chipset_AMD/AMDDrv210.exe

ati_x800xt/rhws3u3_64/fglrx64_4_3_0-8.8.25-1.x86_64.rpm
ATI proprietary driver for ATI X800XT GPU, RHWS3U3_64, v8.8.25-1
www2.ati.com/drivers/linux/fglrx64_4_3_0-8.8.25-1.x86_64.rpm

ati_x800xt/wxp/wxp-w2k-ccc-8-09-041221m-020455c-english.exe
ATI Catalyst driver for ATI X800XT GPU, WXPproSP2, v5.1
www2.ati.com/drivers/wxp-w2k-ccc-8-09-041221m-020455c-english.exe

broadcom_bcm5703c/wxp/win_xp_2k3_32
Broadcom Windows driver for BCM5703C GigE controller on Tyan S2885
ftp://ftp.tyan.com/lan/broadcom/win_xp_2k3_32.zip

firefox_1.0/wxp/Firefox_Setup_1.0.exe

Firefox Web browser for WXPproSP2, v1.0
download.mozilla.org/?product=firefox&os=win&lang=en-US

intel_pwla8492mt/wxp/pro2kxp.exe
Intel Windows driver for PWLA8492MT NIC, v9.2
ftp://aiedownload.intel.com/df-support/4275/eng/pro2kxp.exe

intel_pwla8492mt/wxp/proadmin.exe
Intel Administrative Tools for PWLA8492MT NIC, v9.2
ftp://aiedownload.intel.com/df-support/4237/eng/proadmin.exe

pdsh/rhws3u3_64
Parallel Distributed Shell utility
ftp://ftp.llnl.gov/pub/linux/pdsh/pdsh-2.3-1.src.rpm

siliconimage_3114raid/rhws3u3_64/3114_amd64_rhel33.img
Silicon Image RAID driver for Sil3114 RAID controller on Tyan S2885
For RHWS3U3_64, v20041201
This is a floppy disk image; see driver/ dir for expanded contents
Copy image to disk (e.g. dd if=3114_amd64_rhel33.img of=/dev/fd0)
www.siliconimage.com/support/downloadcenter.aspx

siliconimage_3114raid/wxp/driver
Silicon Image RAID driver for Sil3114 RAID controller on Tyan S2885
For Windows, v1.0.0.7 2004/02/03
Copy all files in dir to floppy, for WXPproSP2 install
www.siliconimage.com/support/downloadcenter.aspx

siliconimage_3114raid/wxp/mgtgui
Silicon Image mgt GUI for Sil3114 RAID controller on Tyan S2885
For Windows, v113
www.siliconimage.com/support/downloadcenter.aspx

soundmax/wxp/
SoundMAX Windows audio driver for Tyan S2885
ftp.tyan.com/audio/s2885/SoundMAX-RELEASE.zip

tyan_s2885/bios_2.02/
Tyan S2885ANRF mainboard BIOS v2.02
ftp.tyan.com/bios/2885_202.zip

tyan_s2885/bios_2.02/autoflash_v2_02.img
Tyan S2885ANRF mainboard BIOS v2.02 auto-flash floppy disk image
Copy image to disk (e.g. dd if=autoflash_v2_02.img of=/dev/fd0)
Bootable from USB FDD, for fully automatic mainboard BIOS update

tyan_s2885/manual_101.pdf
Tyan S2885ANRF mainboard manual v1.01
ftp://ftp.tyan.com/manuals/m_s2885_101.pdf

tyan_s2885/wxp/tsm_2.24
Tyan S2885ANRF Windows mainboard monitoring software, v2.24
ftp://ftp.tyan.com/software/tsm/TyanSysMon_v224.zip

Node names and network interface addresses
H01 (master)
PCI-X Intel PWLA8492MT GigE Link A
MAC: 000423ad2f9c
IP: DHCP
DNS: DHCP
Mainboard Broadcom BCM5703C GigE
MAC: 00e0812c8bdb
IP: 152.2.129.132
DNS: 3dmc-1.cs.unc.edu
H02
Mainboard Broadcom BCM5703C GigE
MAC: 00e0812cb68b
IP: 152.2.129.133
DNS: 3dmc-2.cs.unc.edu
H03
Mainboard Broadcom BCM5703C GigE
MAC: 00e081298e5c
IP: 152.2.129.134
DNS: 3dmc-3.cs.unc.edu
H04

Mainboard Broadcom BCM5703C GigE
MAC: 00e081298e5a
IP: 152.2.129.135
DNS: 3dmc-4.cs.unc.edu

H05
Mainboard Broadcom BCM5703C GigE
MAC: 00e08127603d
IP: 152.2.129.136
DNS: 3dmc-5.cs.unc.edu

HDD partitions (identical across all nodes)

RAID controller on mainboard is configured for RAID0, presenting OS (Windows or Linux) with single 500000 MiB logical HDD, striped across two 250000 MiB physical HDDs

```
/dev/sda1   Linux   EXT3-FS /boot      101 MiB
/dev/sda2   Windows NTFS    C:       35000 MiB
/dev/sda3   Linux   EXT3-FS /        35000 MiB
/dev/sda5   Windows NTFS    D:      199996 MiB
/dev/sda6   Linux   EXT3-FS /d1     204867 MiB
/dev/sda7   Linux   swap             1976 MiB
```

The configuration used here, which relies on the Silicon Image 3114 RAID controller chip and its proprietary closed-source device drivers for Windows and Linux, was NOT our first choice. GraphStream strongly prefers software RAID0 for both Windows and Linux.

GraphStream's original plan was to set up a dual-boot configuration of WXPproSP2 and RHWS3U3_64, sharing a pair of HDDs with separate software RAID0 partitions for Windows and Linux.

We ended up implementing the SiI3114 option because we have not yet found of any reasonable way to run Linux on HDDs that are configured with LDM partition tables, which support the "dynamic disk" configuration that is required for WXPproSP2 software RAID0. We are certainly open to suggestions about how to do this.

One of the principal disadvantages of the SiI3114 option is that it places significant constraints on Linux kernel updates, due to the dependence on a proprietary closed-source driver provided by SiliconImage.

Software setup procedure used by GraphStream for master node H01

1. Tyan S2885ANRF mainboard BIOS v2.02 setup
   More info:
      Tyan S2885 mainboard user manual v1.01, Chapter 3, p. 28
      On 010.unc_20050203 CD: tyan_s2885/manual_101.pdf
   Connect USB FDD (NOT included) to USB port at rear of node
   Insert Tyan S2885ANRF mainboard BIOS v2.02 auto-flash floppy
   Ctrl-Alt-Del or power-cycle to restart node
   F11 key during POST to enter boot device menu
   Boot from USB FDD; allow BIOS update to complete
   Disconnect USB FDD
   Ctrl-Alt-Del or power-cycle to restart node
   DEL key during POST to enter mainboard BIOS Setup
   Exit tab
      Load Optimal Defaults [sets all variables to default values]
   Chipset tab
      AGP Configuration
         Aperture Size
            256 MB
   Advanced tab
      CPU Configuration
         MTRR Mapping
            Discrete
      IDE Configuration
         Onboard PCI IDE Controller
            Disabled
      Floppy Configuration
         Floppy A
            Disabled
      Device & PCI Slots Configuration

Onboard Serial ATA Mode
Raid *** NOTE: system was shipped with a different setting ***
Hardware Health Configuration
Auto FAN1,2,3 Power Control
Enabled
PWM Minimal Duty Cycle
50% Duty Cycle
Exit tab
Save Changes and Exit
F4 during POST to enter Silicon Image RAID setup
Create RAID set
RAID0
Auto Configuration
Ctrl-E to exit Silicon Image RAID setup
DEL key during POST to enter mainboard BIOS Setup
Boot tab
Boot Device Priority
1st Boot Device
03:58-0 SiI RAID0
2nd Boot Device
Pioneer DVD-RW (OD1 connected by default to H01)
Exit tab
Save Changes and Exit

2. HDD partition setup
Connect OD1 USB cable to USB port at rear of node
Insert RHWS3U3_64 binary CD 1/4 into OD1
Connect USB FDD to USB port at rear of node
Insert Silicon Image Linux RAID driver floppy v20050203.0 into FDD
Ctrl-Alt-Del or power-cycle to restart node
F11 during POST to get Boot menu; select Pioneer DVD-RW
prompt> linux rescue noprobe <Enter>
Language Selection: English
Keyboard Selection: us
Ctrl-Alt-F2 to switch to shell after Devices dialog appears
bash> mkdir /f # mount point for RAID driver floppy
bash> mknod /dev/sda b 8 0
bash> mknod /dev/sdb b 8 16
bash> mount /dev/sda /f
bash> /f/initial_install.sh # load RAID driver
NOTE: at this point, FDD is /dev/sda, HDD RAID0 is /dev/sdb
bash> fdisk /dev/sdb # RAID0 device
Use fdisk commands to create and write partition table:
Device Boot Start End Blocks Id System
/dev/sdb1 1 13 104391 83 Linux
/dev/sdb2 * 14 4475 35841015 7 HPFS/NTFS
/dev/sdb3 4476 8937 35841015 83 Linux
/dev/sdb4 8938 60802 416605612+ f Win95 Ext'd (LBA)
/dev/sdb5 8938 34433 204796588+ 7 HPFS/NTFS
/dev/sdb6 34434 60550 209784771 83 Linux
/dev/sdb7 60551 60802 2024158+ 82 Linux swap
Ctrl-Alt-F1 to switch back to installation dialog
Devices: usb-storage found; Done
Network interfaces: No
Rescue: Continue, OK
bash> exit # reboot

3. WXPproSP2 setup
Insert WXPpro CD into OD1
Insert Silicon Image Windows RAID driver floppy v20050203.0 into FDD
Ctrl-Alt-Del or power-cycle to restart node
F11 during POST to get Boot menu; select Pioneer DVD-RW
F6 to request third-party HDD controller driver
Select HDD controller driver: Silicon Image RAID
Select HDD partition 2 for WXPpro install
Accept Silicon Image RAID driver (has not passed Windows Logo test)
Accept default Regional and Language Options
Enter Name: "Greg Welch"
Enter Organization: "UNC"
Enter Computer name: "3dmc-1"
Enter Administrator password: "3dmc"
Enter Time Zone: [GMT-05:00] Eastern Time (US & Canada)
Networking Settings: accept default "Typical settings"
Workgroup or Computer Domain: accept default workgroup = "WORKGROUP"
Enter "Your name" for user account: "welch"

Control panel
Switch to Classic View
User Accounts
Change the way users log on or off
Uncheck "Use the Welcome screen"
Apply changes
Logout
Login as Administrator
Control Panel
Administrative Tools
Computer Management
Local Users and Groups
Users
Delete account "welch"
Display Properties
Settings
Screen Resolution
1280x1024
My Computer
Properties
Computer Name
Change
More
Change primary DNS suffix to cs.unc.edu
Insert 010.unc_20050203.0 CD into OD1
Install broadcom_bcm5703c/wxp/win_xp_2k3_32
Control Panel
Network Connections
Remame "Local Area Connection <n>" to "Mainboard NIC"
Control Panel
Network Connections
Mainboard NIC
Properties
Internet Protocol (TCP/IP)
IP address: 152.2.129.132
Subnet mask: 255.255.255.0
Default gateway: 152.2.129.1
DNS server: 152.2.129.1
Run Windows Update repeatedly until all available updates are installed
Choose "Custom Install" each time to get all optional updates
Install amd_8000/wxp/AMDDrv210.exe
Install ati_x800xt/wxp/wxp-w2k-ccc-8-09-041221m-020455c-english.exe
Install firefox_1.0/wxp/Firefox_Setup_1.0.exe
Install intel_pwla8492mt/wxp/pro2kxp.exe
Install intel_pwla8492mt/wxp/proadmin.exe
Install soundmax/wxp
Install tyan_s2885/wxp/tsm_2.24/TSMNS224.EXE
Install tyan_s2885/wxp/tsm_2.24/TSMNC224.EXE
Control Panel
Administrative Tools
Computer Management
Disk Management
Format D: as NTFS volume d0
Adjust user interface settings (details omitted)

4. RHWS3U3_64 setup
Insert RHWS3U3_64 binary CD 1/4 into OD1
Connect USB FDD to USB port at rear of node
Insert Silicon Image Linux RAID driver floppy v20050203.0 into FDD
Ctrl-Alt-Del or power-cycle to restart node
F11 during POST to get Boot menu; select Pioneer DVD-RW
prompt> linux text noprobe <Enter>
CD Found: Skip media test
Ctrl-Alt-F2 to switch to shell after Devices dialog appears
bash> mkdir /f # mount point for RAID driver floppy
bash> mknod /dev/sda b 8 0
bash> mount /dev/sda /f
bash> /f/initial_install.sh # load RAID driver
NOTE: at this point, FDD is /dev/sda, HDD RAID0 is /dev/sdb
Ctrl-Alt-F1 to switch back to installation dialog
Devices: usb-storage found; Done
Language Selection: English
Keyboard Selection: us
Mouse Selection: Generic - Wheel Mouse (PS/2)
Disk Partitioning Setup: Disk Druid

```
Keep existing partitions
Edit /dev/sdb1: format as ext3; set mount point to /boot
Edit /dev/sdb3: format as ext3; set mount point to /
Edit /dev/sdb6: format as ext3; set mount point to /d1
Edit /dev/sdb7: format as swap
Choose GRUB boot loader
No special boot loader options
No boot loader password
No additional boot menu entries
Install boot loader in /dev/sdb MBR
Network configuration for eth0: 152.2.129.132, 255.255.255.0
Network configuration for eth1: DHCP, onboot=no
Gateway: 152.2.129.1
Primary DNS: 152.2.129.1
Hostname: h3dmc-1.cs.unc.edu (change later to 3dmc-1.cs.unc.edu; see below)
No firewall
Language: English (USA)
Time Zone: System clock uses UTC; America/New_York
Root password: 3dmc3dmc (change later to 3dmc; see below)
Customize package selection
   Add Kernel Development
   Add X Software Development
   Add System Tools
Insert RHWS3U3_64 binary CDs 2/4, 3/4, 4/4, 1/4 into OD1 as requested
Skip X configuration
Ctrl-Alt-F2 to switch to shell
bash> /f/upgrade_driver.sh # set up RAID driver in initrd
Ctrl-Alt-F1 to switch back to installation dialog
Disconnect USB FDD; subsequently, HDD RAID0 is /dev/sda
Reboot
Use GRUB 'e' command to append "single" to kernel command line
Use GRUB 'b' command to boot into singleuser shell
bash> cp /etc/inittab /etc/inittab.std
bash> vi /etc/inittab
#   change id:5 to id:3 (start in runlevel 3; no X)
bash> exit # continue to runlevel 3
Login as root
bash> mkdir /master # dir on master node to be NFS-mounted on camera nodes
Insert 010.unc20050203.0 CD into OD1
bash> mount /mnt/cdrom
bash> cp -r /mnt/cdrom /master/010.unc20050203.0
bash> eject
bash> rpm -e --allmatches --nodeps XFree86-Mesa-libGL
bash> cd /master/010.unc20050203.0/ati_x800xt/rhws3u3_64
bash> rpm -i fglrx64_4_3_0-8.8.25-1.x86_64.rpm
bash> cp XF86Config-4 /etc/X11
bash> cp /etc/inittab.std /etc/inittab # default is runlevel 5 with X
bash> init 5
Login as root
Main menu
   Preferences
      Windows
         Check "Select windows when the mouse moves over them"
Adjust user interface settings (details omitted)
RightAlt-F2 xterm <Enter> # open shell window
bash> passwd
#   change root password to 3dmc
bash> vi /etc/fstab
#   change dev/sdb7 to /dev/sda7
bash> cp /etc/fstab /etc/fstab.camera
bash> vi /etc/fstab.camera
# add:
#   3dmc-1:/master  /master nfs rw,sync 0 0
bash> cp /boot/grub/grub.conf /boot/grub/grub.conf.std
bash> vi /boot/grub/grub.conf
# remove:
#   boot entries for RHWS3U3_64 SMP and non-SMP
# add:
#   title Microsoft Windows XP Professional SP2
#       rootnoverify (hd0,1)
#       makeactive
#       chainloader +1
#   title Red Hat Enterprise Linux WS v3.0 X86_64 Update 3
#       root (hd0,0)
#       kernel /vmlinuz-2.4.21-20.ELsmp ro root=LABEL=/
```

```
#       initrd /initrd-2.4.21-20.ELsmp.img
bash> vi /etc/modules.conf
# remove:
#   alias scsi_hostadapter sata_sil
# add:
#   alias eth1 e1000
#   alias eth2 e1000
bash> vi /etc/sysconfig/network
#   change all occurrences of h3dmc-1 to 3dmc-1
bash> vi /etc/hosts
# remove:
#   h3dmc aliases for 127.0.0.1
# add:
#   152.2.129.132   3dmc-1.cs.unc.edu 3dmc-1
#   152.2.129.133   3dmc-1.cs.unc.edu 3dmc-2
#   152.2.129.134   3dmc-1.cs.unc.edu 3dmc-3
#   152.2.129.135   3dmc-1.cs.unc.edu 3dmc-4
#   152.2.129.136   3dmc-1.cs.unc.edu 3dmc-5
bash> vi /etc/resolv.conf
# add:
#   nameserver 152.2.129.1
bash> vi /etc/hosts.equiv
# add:
#   127.0.0.1
#   152.2.129.132
#   152.2.129.133
#   152.2.129.134
#   152.2.129.135
#   152.2.129.136
bash> cp /etc/hosts.equiv /root/.rhosts
bash> cp /etc/securetty /etc/securetty.std
bash> vi /etc/securetty
# add:
#   rsh
#   rlogin
Insert RHWS3U3_64 binary CD 1/4 into OD1
bash> mount /mnt/cdrom
bash> mkdir /master/rhws3u3_64.rpm
bash> cp /mnt/cdrom/RedHat/RPMs/*.rpm /master/rhws3u3_64.rpm
bash> eject
Insert RHWS3U3_64 binary CD 2/4 into OD1
bash> mount /mnt/cdrom
bash> mkdir /master/rhws3u3_64.rpm
bash> cp /mnt/cdrom/RedHat/RPMs/*.rpm /master/rhws3u3_64.rpm
bash> eject
Insert RHWS3U3_64 binary CD 3/4 into OD1
bash> mount /mnt/cdrom
bash> mkdir /master/rhws3u3_64.rpm
bash> cp /mnt/cdrom/RedHat/RPMs/*.rpm /master/rhws3u3_64.rpm
bash> eject
Insert RHWS3U3_64 binary CD 4/4 into OD1
bash> mount /mnt/cdrom
bash> mkdir /master/rhws3u3_64.rpm
bash> cp /mnt/cdrom/RedHat/RPMs/*.rpm /master/rhws3u3_64.rpm
bash> eject
bash> rpm -i /master/rhws3u3_64.rpm/rsh-server-*
bash> cd /etc/xinetd.d
bash> cp rsh rsh.std
bash> cp rlogin rlogin.std
bash> vi rsh
#   comment-out "disabled = yes"
bash> vi rlogin
#   comment-out "disabled = yes"
bash> /etc/init.d/xinetd restart
bash> ssh-keygen -t rsa1
bash> ssh-keygen -t dsa
bash> cat ~/.ssh/identity.pub >> ~/.ssh/authorized_keys
bash> cat ~/.ssh/id_dsa.pub >> ~/.ssh/authorized_keys2
bash> cp /etc/exports /etc/exports.camera
bash> vi /etc/exports
# add:
#   /d1 152.2.129.0/24(rw,no_root_squash,sync)
bash> exportfs -a
bash> chkconfig --level 345 nfs on
bash> /etc/init.d/nfs start
```

```
bash> cp /etc/sysctl.conf /etc/sysctl.conf.std
bash> vi /etc/sysctl.conf
#   set kernel.sysrq to 1
bash> chkconfig --level 0123456 cups off
bash> chkconfig --level 0123456 gpm off
bash> chkconfig --level 0123456 hpoj off
bash> chkconfig --level 0123456 ip6tables off
bash> chkconfig --level 0123456 iptables off
bash> chkconfig --level 0123456 isdn off
bash> chkconfig --level 0123456 mdmonitor off
bash> rpm -i /master/010.unc20050203.0/pdsh/rhws3u3_64/*.x86_64.rpm
bash> cp /master/010.unc20050203.0/pdsh/rhws3u3_64/pdsh.* /etc/profile.d
bash vi /master/pdsh_hosts
# add:
#   3dmc-2
#   3dmc-3
#   3dmc-4
#   3dmc-5
```

Software setup procedure used by GraphStream for each camera node H02 - H05

1. Tyan S2885ANRF mainboard BIOS v2.02 setup
   Identical to H01, EXCEPT the following additional steps:

```
   DEL key during POST to enter mainboard BIOS Setup
   Advanced tab
      Device & PCI Slots Configuration
         Gigabit LAN Option Rom
            Enabled
   Exit tab
      Save Changes and Exit
   DEL key during POST to enter mainboard BIOS Setup
   Boot tab
      Boot Device Priority
         1st Boot Device
            03:58-0 SiI Raid0
         2nd Boot Device
            MBA v6.2.11 Slot 0 (PXE network boot)
   Exit tab
      Save Changes and Exit
```

3. HDD clone procedure for each camera node H02 - H05

```
   Power-down H01 and camera node
   Transfer camera node HDD #0 to H01 HDD slot #2
   Transfer camera node HDD #1 to H01 HDD slot #3
   Power-up H01
   F4 during POST to enter Silicon Image RAID setup
      If a "Conflict" is shown, execute "Resolve Conflict"
      If there is not already a RAID set with HDDs #2 and #3, create one:
         RAID0
         Auto Configuration
   Ctrl-E to exit Silicon Image RAID setup
   Boot RHWS3U3_64
   Login as root
   RightAlt-F2 xterm <Enter> # open shell window
   bash> umount /boot /d1
   bash> dd if=/dev/sda of=/dev/sdb bs=512 count=1
   bash> fdisk /dev/sdb
   #   Delete partial partition 4, then create partitions 4, 5, 6, 7
   #      Device Boot    Start       End    Blocks   Id  System
   #   /dev/sdb1             1        13    104391   83  Linux
   #   /dev/sdb2   *        14      4475  35841015    7  HPFS/NTFS
   #   /dev/sdb3          4476      8937  35841015   83  Linux
   #   /dev/sdb4          8938     60802 416605612+   f  Win95 Ext'd (LBA)
   #   /dev/sdb5          8938     34433 204796588+   7  HPFS/NTFS
   #   /dev/sdb6         34434     60550 209784771   83  Linux
   #   /dev/sdb7         60551     60802   2024158+  82  Linux swap
   bash> dd if=/dev/sda1 of=/dev/sdb1 bs=2M
   bash> dd if=/dev/sda2 of=/dev/sdb2 bs=2M
   bash> mkfs.ext3 -L / /dev/sdb3
   bash> mkdir /0
   bash> mount /dev/sdb3 /0
   bash> rsync -av \
      --exclude="/0" \
      --exclude="/master/*" \
```

```
    --exclude="/proc/*" \
    --exclude="/tmp/*" \
    --exclude="/var/tmp/*" \
    / /0
bash> mv /0/etc/exports.camera /0/etc/exports
bash> mv /0/etc/fstab.camera /0/etc/fstab
bash> vi /0/etc/sysconfig/network
#   change hostname
bash> vi /0/etc/sysconfig/network-scripts/ifcfg-eth0
#   change IP address
bash> umount /0
bash> mkfs.ext3 -L /d1 /dev/sdb6
bash> mkswap /dev/sdb7
bash> init 0
Transfer camera node HDD #0 back to camera node slot #0
Transfer camera node HDD #1 back to camera node slot #1
Power-on camera node
Boot WXPproSP2
My Computer
   Properties
      Computer Name
         Change
Control Panel
   Network Connections
      Mainboard NIC
         Properties
            Internet Protocol (TCP/IP)
               IP address: 152.2.129.<n>
   Administrative Tools
      Computer Management
         Disk Management
            Format D: as NTFS volume d0

--------------------------------------------------------------------------------
End
--------------------------------------------------------------------------------
```