

Building an Access Grid Node

From Room Construction to Equipment Configuration

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Building an Access Grid Node: From Room Construction to Equipment Configuration by Gary Refka

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Added reference and link to Jennifer Teig von Hoffman's Gentner configuration document from Chapter 5, along

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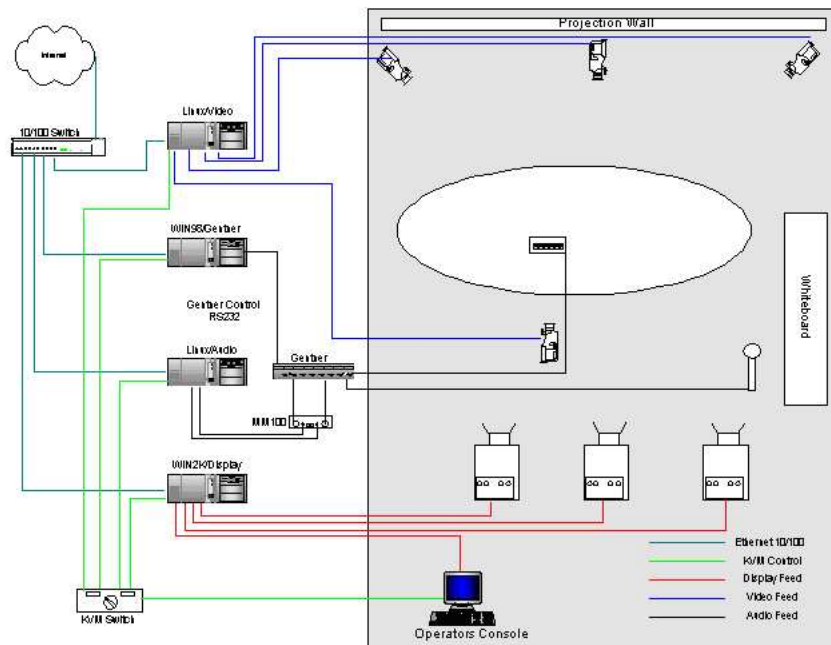
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Chapter 1. Access Grid Introduction

The Access Grid is a virtual collaboration tool designed to create a compelling interactive system that facilitates collaboration between physically separated spaces. The design creates an atmosphere that enhances the exchange of ideas and open lines of communications. This is accomplished through the careful marriage of audio, video and graphical tools configured in the Access Grid creating an environment that allows the participants to feel as if they are engaged personally rather than in the stiff structured environment of a typical videoconference. To create this space careful consideration must be placed not only on the equipment setup but also in the construction and configuration of the Access Grid Room.

The Access Grid Node is made up of three sections, the Audio system, Video System and the Network. These components are combined to create the Access Grid space that is used by the participants of a session. The Video and Audio systems are comprised of computers running Linux, Windows 2000 and Windows 98, as well as cameras, mixers, projectors and other components.

Below is an example of a Access Grid Node and the connectivity between components. This configuration is intended to give the reader an idea of how a room would be layed out but does not represent an actual room. The physical room that the participants use contains cameras, microphones, and projectors that allow the users to interact with remote users. The operator's console, through a Keyboard-Video-Mouse (KVM) switch controls the Audio, Video, Control and Display machine which makes up the computing force for the node. All of these components are connected via a multicast enabled switch to the wide area network. More detail is provided for each component within the document.



The following document covers the installation and considerations required for the Audio systems, Video systems, network and room construction.

Chapter 2. Room Construction

Room Evaluation

Careful consideration must be given when choosing the proper facility in which to install the Access Grid Node. You should consider the uses that your Access Grid Node must support, such as remote collaboration (both point to point and multipoint), instructor-led training, company-wide broadcasts, or other events. As an example, if you broadcast an instructor-led training course from your facility, you will need a room that is large enough to seat students, a way to capture of all of the students in the room on camera, and a way to project a clear, large image of the instructor. Compare this to a small distance-collaboration meeting from your conference room where all of your participants should be on camera because they will be talking to distant colleagues who are viewing the broadcast.

The size of the room will influence the number of projectors, cameras, and microphones and their placement, needed to cover the room. A minimum of three projectors is recommended to supply adequate real estate for Access Grid images. Please see the MuralGeom configuration tool at <http://www.accessgrid.org/software/MuralGeom1b05.xls> for assistance in calculating the proper size and spatial positioning of the displayed area. These projectors may be a front or rear mounted system depending on available space and budget. Rear projection systems provide for a better image and cleaner installation but typically cost more in dollar and real estate as compared to a front projection system. The image can be projected directly on an available wall that can be treated with flat white paint or WallTalker screen material. This is a wallpaper type product that can be written on and erased much like dry wipe boards.

The projection system should be installed so that a natural viewing angle is obtained for the participants in the room. A too high or too low placement causes the participants to look up or down which effects the overall experience by giving the remote participants the impression you are looking somewhere other than at them. This would cause them to wonder whether you are listening or focusing on their input. At the same time, large angles in the projection can cause "keystoning", which distorts projected image and can impair the quality of the projected image. Even after the correction with the projector controls, aligning the multiple projectors can be problematic. The optimal location for placement of the projectors may not be possible and a compromise between placement and quality will need to be reached.

Cameras are placed so that there is full coverage of the participants in the room with primary and secondary views. The cameras should also cover demonstration material such as whiteboards, as well as the projected display wall. In most cases this will provide a complete image of the facility and requires 4 cameras - Presenter, Primary and Secondary Audience and a Projection Wall cameras.

Cameras may be mounted on tripods, shelves, or for a cleaner look, recessed into the wall. They should be placed so that a natural image of the participants is projected to the other users on the Grid. Placement too high or too low will give an unusual angle that may annoy users and will detract from the experience and thus should be avoided. If possible, placing the audience cameras just below the projected images creates the effect that the participants are looking at the people at the distant end. The overall impression that the Access Grid conveys is of actually being in the same room as the participants from the other nodes. As such, the placement of the camera and projected image should try to create this effect.

The microphone and speaker placement is critical for providing a compelling experience when using the Access Grid. Research has shown that the audio experience, even more so that the visual component is the most important aspect of the meeting and any degradation or impairment will reduce the experience. This can be to a point that the irritation of the poor sound quality will cause the users to abandon the use of the Access Grid. Sophisticated audio equipment, such as the Gentner AP400, is used to combat these issues, but the placement of the microphones and speakers in the room plays a major role. Microphones and speakers

that are placed too close together will cause audio problems such as echo, feedback, and distortion. Some of these issues can be overcome through adjustment of the "gain controls" and the echo canceling abilities and of the Gentner AP400 & 800 (see the user manual for details).

Location and positioning of the microphones will be determined by room size, furniture layout, and intended usage. As a rule of thumb, microphones should be placed within 2 to 5 feet of any intended speaker. These include anyone participating in a group discussion. The tabletop Crown microphones may be placed on tables and other flat surfaces to pick up the normal conversations of the room. Directional microphones are best used for presenters or to help fill the gaps in the room coverage. Additionally special use systems like collar or lapel microphones, such as those used in TV broadcasts or wireless may also be employed.

The type of system that is being deployed as well as the Access Grid room will determine speaker placement. Genelec Monitor Bi-Amplified speakers are simply placed in an inconspicuous location near the projection wall. This placement will give the impression of the remote users voice is coming from the same location as their visual image, focusing the local users attention in that direction. This works well in a smaller room where the sound does not need to carry very far.

A surround sound system will deploy speakers throughout the room and provides a non-directional sound quality. This is best deployed in a large facility where front mounted speakers would not provide adequate coverage. While this normally provides superior sound quality, the speaker - microphone separation must be addressed during room configuration to eliminate audio feedback. This is readily accomplished in a large facility but can be problematic in a smaller space.

Access Grid Room Plan

Once a clear picture of the required layout is obtained, you can begin selection of the appropriate components from the approved equipment list in this document. Whenever possible develop a basic diagram and plan to guide the installers during construction. The plan should detail component placement including any shelving required to support it, cable placement and routing to racked equipment, and technicians' console placement. Thought must be given to how cabling will be routed so that it will be as unobtrusive as possible. This often requires long cable runs and the amount of cable needed must be taken into account when procuring equipment.

Another consideration will be the location of the racked equipment - computers, Gentner, networking gear, etc. This equipment, like any high performance electronic equipment, utilizes fans to dissipate heat generated during operation. These fans generate a significant amount of noise that will have a detrimental effect on sound quality. It is recommended that this equipment be placed in a room adjacent to the Access Grid room to eliminate this problem. Keep in mind that the operators console must be available in the Access Grid room itself. If this is not a practical solution, the equipment will need to remain in the Access Grid room and some form of noise suppression must be obtained that will not impede the flow of cooling air. This may also be accomplished by placing the equipment away from the users in a larger facility.

Once the equipment has been obtained installation may begin. It is recommended that computers be pre-loaded to speed installation but they may be configured once they are in place. This will be determined by availability of time and access to the equipment for staging. Staging simplifies the installation by verifying the condition off the equipment and ensuring all of the components are functioning properly.

Notes

1. <http://www.accessgrid.org/software/MuralGeom1b05.xls>
2. As an image is projected onto a screen or wall, the angle created can make the projected image appear to be narrower at the bottom than at the top. This

looks like the central wedge-shaped stone in the center of an arch in a building. A few projectors automatically correct for this distortion. Some projectors have a manual adjustment; others have a fixed, non-flexible keystone correction feature.

Chapter 3. Installation Checklist

- Inventory Equipment and verify against order list
- Rack mount servers, Gentner, MM100, LAN Switch and other equipment
- Load servers from the AG CDs unless completed during staging. (See server installation for more details)
- Position and mount Projectors (see room construction plan for details)
- Position and mount Cameras (see room construction plan for details)
- Position and mount Speakers (see room construction plan for details)
- Run audio cables (see audio system for details)
- Run video cable (see video system for details)
- Run projector cables (see display system for details)
- Connect LAN to Access Grid LAN Switch

Chapter 4. Server Installation

Two Linux servers running the audio and video systems, a Windows 2000 machine running the display and a Windows 98 machine controlling the Gentner supply the computer power for the Access Grid Node. The machines are populated with the equipment as specified in the equipment specification portion of this document. The following procedures assume that all machines have the appropriate equipment installed and the machines are functional. It is also assumed that the reader has general knowledge of Windows and Linux installation and configuration; if this is not the case, please consult Windows 2000 and Linux administrators' guides.

Network Preparation

Since the computers in an Access Grid node will be communicating with other computers across the network, it is necessary that they be configured to have access to the Domain Name Service. Your local network administration staff will be able to tell you the IP addresses of the DNS servers for your installation. Your computers should be registered with the local DNS server so that computers elsewhere on the network can both refer to them by name and be able to map their IP address back to a name. If this is not possible, host tables can be configured on the Linux and Windows machines as a temporary workaround.

It is also very convenient to configure the AG computers to use DHCP to obtain IP addresses. A well-configured DHCP installation will also provide its clients the appropriate DNS servers to use. Again, talk to your local network administrators for information on DHCP. They might ask for hardware Ethernet addresses for your computers. You can obtain these with the `/sbin/ifconfig` command on Linux, or with the `ipconfig` command on Windows.

Linux Installation

This installation assumes that the computers to be loaded meet the specifications that are listed in the technical requirements.

Please note that an "ag" account is created by the installation program. The password on this account should be changed after installation is complete.

Warning: When the system installs the Linux OS all information currently on the system will be lost.

1. Insert the Linux Installation CD into the CD drive of the pc and power up the machine to begin Linux installation. After a series of questions a boot prompt will appear.
2. Press enter.

The computer will go through a start up routine where the system checks for hardware and then will display a welcome message and will move on to a Language Selection menu.

(If your CD-ROM drive is not detected add the following option at the boot prompt

```
boot: linux hdc-cdrom )
```

3. Select the appropriate language and click next.
4. Select the appropriate keyboard model and layout from the menu and click next.
5. Select the appropriate mouse and click next.

If your mouse is not listed select the appropriate generic mouse. If you use a two-button mouse check to ensure the three-button emulation option is selected (this is the default.)

6. The RedHat Install screen will appear. Click Next.
7. Select the Access Grid install option from the menu and click Next.
8. Partition the system using the automatic partitioning tool. *This is the recommended way to partition the drive.* Select the remove all data button.

Note: You may get a "Partition Corrupted" message when formatting a new machine. Select initialize and continue.

Note: If for some reason the system needs to be partitioned manually use the following information as a guide. If this system was used prior to this installation, other partitions may exist. It is recommended that the old partitions be deleted. All data will be lost.

/boot = 1 GB

/swap = 256 MB or equivalent of the installed RAM

/ (denotes root) = remainder of the hard drive or 7.75 GB (You may select the "Grow to Remainder" option to utilize the remainder of the space.

9. Configure the network information and click next.

Enter the appropriate network information and select activate on boot. The host name will be the name the computer will be identified as on the network, such as "audio" or "video" depending on which machine you are configuring. If you are unsure as to your network configuration, contact your LAN administrator.

10. Select the appropriate time zone from the menu and click next.
11. Enter the root password and an "ag" account and click next.

The password selected should be created with standard password precautions in mind. Remember, password and login names are case sensitive.

12. Select "Install packages to satisfy dependencies" button and click next.
13. Select your monitor configuration and click next.

You may search through the monitor database for your particular monitor or you may enter the parameters manually. You may damage your monitor if a frequency is selected that is not compatible with your monitor. Please consult your monitor's operator manual or the manufacturer's WEB site for the information.

14. Select the video driver and memory for your card and click next.

The system will probe your hardware and normally comes up with the correct configuration. Only change the parameters if you know that the selected option is incorrect.

15. Click the test configuration button. A window will appear asking if you can read the window yes/no. Select yes. Click next after returning from test.
If you do not see the window, return to step 12 and verify your selections.

16. If this monitor, video card combination will be your final configuration you may select Start in network mode.

If after installation your video configuration is changed, you will need to modify your X-Window configuration. If you get a blank monitor after entering X-Windows mode ctrl-alt-F1 will switch you to a terminal session. Remember that your X-Window will still be running!

17. Click next to begin installation. Last chance to cancel.

At this point the system will begin to format the disk and load Linux plus the Access Grid components. Go grab some coffee and check your e-mail.

18. Once the install is complete the option for creating boot disk will appear. It is recommended that you create a boot disk and keep this in a known safe place.
19. Restart the machine per the instructions.

As the machine restarts the CD-ROM will eject the disk. You need to remove this or the install will begin again.

Starting up Linux

The Linux machine at this point will start up in text mode rather than a GUI interface. This will allow the user to make changes in the system that may be incompatible with Xwindows. The normal operating mode for the Access Grid is Xwindows that can be started as follows.

1. At the login enter root .
2. At the password enter root password for this machine.
3. Type startx .

Linux System Configuration

Once the machine has completed the setup and has rebooted, it's time to finish configuring the system for use within the Access Grid. The system relies on named hosts to send information between machines from the venue's software. If the host tables are not configured correctly the system will not move from room to room as intended.

Network Information

1. From the Main Menu button (the foot on the task bar to the left) select AnotherLevel Menu>Administration>network configuration.
2. On the main screen verify that all the information is correct and enter the domain name server (DNS) if applicable.

Note: It is highly recommended to use a DNS server for server naming. The section "Manual Configuration of Host File" should only be used if DNS is not an option. Complete the steps outlined in that section prior to continuing with step three.

3. Ensure that the information in the interface and routing tabs is correct and select save and quit.
4. Open a Terminal Window and run "set-display-machine {display machine name}" enter.

The display machine name must match the display name given in host table

Manual Configuration of Host File

1. From the Main Menu button (the foot on the task bar to the left) select AnotherLevel Menu>Administration>network configuration.
2. Select host and add the following host names by selecting add at the bottom of the window.

IP Address	Name	Nickname
xxx.xxx.xxx.xxx	display	display.< domain name >
xxx.xxx.xxx.xxx	video	video.< domain name >
xxx.xxx.xxx.xxx	audio	audio.< domain name >
xxx.xxx.xxx.xxx	control	control.< domain name >

Replace the entry under Name with the appropriate name for that machine.

Set Linux to boot in Graphics mode

1. On the Start menu (Foot on bottom left of task bar) select System>Control Panel
2. In the control panel window select System Configuration (Last item)
3. The Linux Configuration menu will appear. Select Boot mode > Mode> Default Boot Mode
4. On the right side of the window select Graphic & Network under default operating mode.
5. Select act changes exit.
6. Logout of root.

Audio Machine Configuration

On the audio machine, the OSS license for the SoundBlaster card must be loaded prior to operation. This requires that the license file, "license.dat" obtained from www.opensound.com¹ be available and loaded into a known location.

1. Log in as root.
2. Copy the license.dat file from the floppy disc to the hard drive using the commands in a command prompt window.

```
mount /dev/fd0 /mnt/floppy
```

```
cp /mnt/floppy/license.dat /usr/local/ag/lib/ag-install/license.dat
```

3. Start the setup-oss process.

In a terminal complete the following

- a. cd to /usr/local/ag/lib/ag-install and hit enter
- b. Type ./setup-oss and hit enter
- c. Type "Y" in reply to loading kernel driver as a module.
- d. A software license agreement page will come up. Read and accept.
- e. Read the How-to file and tab to ok.
- f. Select the /usr/lib/oss location to store files
- g. Auto detection should finish. Hit ok.
- h. Arrow down to "intall license file" and hit enter.
- i. Enter "/usr/local/ag/lib/ag-install/license.dat" and hit enter.
- j. Instructions come up advising you to save the license file on a floppy. Since we have this from a previous step, just hit ok.
- k. Arrow down to Automatic Boot Setup and hit ok.
- l. Select Enable at Startup and hit ok.
- m. Save and exit.

Video Server Configuration

Once the system is up and running you must set the session parameters for the vrm-eventlistener. The video computer needs to be configured for the number & name of video capture cards it has, and with the node's name. To do this run setup-config.

1. Log in as root.
2. In a terminal window on the video machine type setup-config
3. From the pull down menu select the appropriate camera interface - composite, television, s-video - for each video card in system.
4. Select camera name - main, presenter, audience.
5. Enter the name of the node.

This name is the name that will be viewed by the participants in a collaboration session in the top edge of the video window. This name must include the name of your institution to identify you to the other participants.

6. Click on write output and exit.

Create Launchers

To simplify start-up of the video and audio tools, create a launcher on the desktop for vrm-eventlistener on the video machine and arm-eventlistener on the audio machine. These steps should be completed while logged in as "AG".

- a. Log in as AG to Audio or Video machine
- b. Click the right mouse button on the desktop and select new>launcher.
- c. Enter arm-eventlistener or vrm-eventlistener as appropriate in the name field.
- d. Enter /usr/local/ag/bin/ arm-eventlistener/ or vrm-eventlistener as appropriate, in the command field.
- e. Make sure the type box is set to application.
- f. Select an icon
- g. Click ok.
- h. Repeat for Audio or Video machine.

Display Server installation

The following installation procedures assume that you have a working Win2K system. If you are starting with an un-configured machine, please follow the Microsoft installation instructions from the Windows 2000 package. Prior to installation of the software, install all hardware specified in the equipment specifications portion of this document per manufactures' instructions.

The Win2K system needs to be configured with an Administrator account and an "ag" account. The Administrator account will be used for the installation of the system and the ag account will be used for day to day operations.

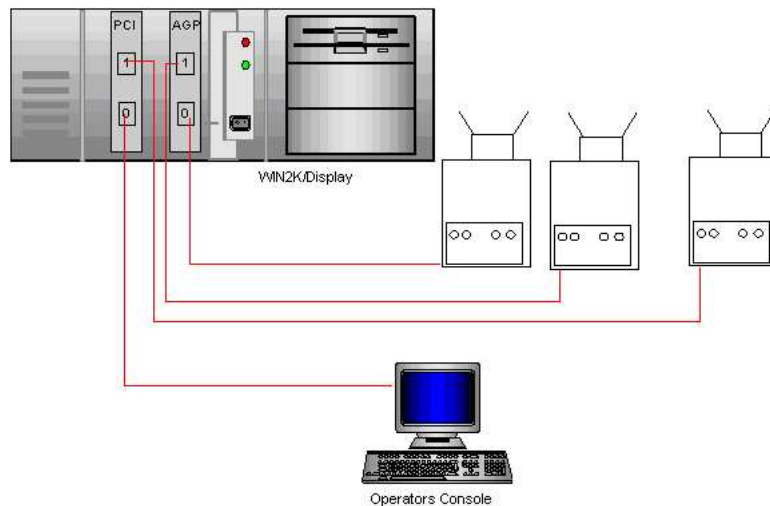
Note: When you boot the W2K machine for the first time with the multi-display card, the system may appear to hang after the starting windows window. To correct this, re-start the machine but select F8 during start-up and modify boot options. Select VGA mode and continue booting. Once the system is up set the desktop display parameters for the multiple displays.

1. Insert AG CD into CD-ROM drive.

2. Open the CD and select AGsetup.
3. Welcome window opens select next.
4. Readme file opens. Read and click next.
5. Start Installation screen. Click next.
6. Software is installed. Click next to finish.

Setting Desktop Display Parameters

Note: When physically connecting the display devices to the Display machine. Ensure that the two "primary" viewing areas where the majority of images will be displayed, are connected to the AGP video card and not the PCI card. Using the drawing below as an example, the Operator's Console Monitor would be on port 0 of the PCI, the first two projectors would be on ports 0 and 1 of the AGP card and the third projector would be on Port 1 of the PCI card.



1. Right mouse click on the desktop and select properties.
2. From the tabs select settings.
3. Set each display that will be connected to a projector to 1024x768, 32 bit color.
4. On each projector display check the "extend desktop to this monitor" box.
5. Ensure the displays are set to the proper order for your configuration.

Setting Network Parameters

Set the appropriate IP address, Netmask, Gateway and DNS information.

1. Right mouse click on "My Network Places" and select properties.
2. Right mouse click on LAN connections and select properties.
3. Select TCP/IP settings and select properties
4. Insert appropriate information. If you have any questions contact your local administrator for information.
5. *To Define the Hosts in the hosts file if DNS is not available*
 - Go to Start>Find Files or Folders
 - Enter hosts in the search and you should see a file called hosts
 - Open file with notepad and add the following to the end of the file. Replace the italicized portions with your local information.

IP Address	Name
xxx.xxx.xxx.xxx	display
xxx.xxx.xxx.xxx	display.< domain name >
xxx.xxx.xxx.xxx	video
xxx.xxx.xxx.xxx	video.< domain name >

```

xxx.xxx.xxx.xxx    audio
xxx.xxx.xxx.xxx    audio.< domain name >
xxx.xxx.xxx.xxx    control
xxx.xxx.xxx.xxx    control.< domain name >

```

- Save and close the file

6. Connect system to the network.

Control Computer Configuration

The control computer is used to monitor, control, and adjust the Gentner Audio system. This requires a Windows 98 computer connected to the Gentner device through a RS-232 cable. The following procedures assume a working Win 98 machine with a network connection to the Internet. The software required for this installation can be found at the Gentner site http://www.gentner.com/tech_support/resource/view.php?resid=285&qstring=/tech_support/produ

1. Connect the RS-232 cable, provided in the Gentner package, between the RS-232 port on the Gentner and Com 1 of the computer.
2. Connect to the Gentner site at http://www.gentner.com/tech_support/resource/view.php?resid=285&qstring=/tech_support/produ
3. Download and install the AP software to the Control machine

Notes

1. <http://www.opensound.com>
2. http://www.gentner.com/tech_support/resource/view.php?resid=285&qstring=/tech_support/produ
3. http://www.gentner.com/tech_support/resource/view.php?resid=285&qstring=/tech_support/produ

Chapter 5. Audio System

It's recommend to test all connection with an ohmmeter during installation to ensure the functionality and proper configuration of the cables. Improperly pinned cables, or broken leads, can create audio problems which are difficult to pin point.

Audio Server to Gentner Connections

The following cables will be needed to connect the Audio PC to the Gentner device -

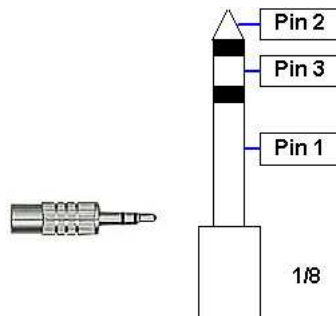
- (1) XLR Male to Gentner Phoenix
- (1) XLR Female to Gentner Phoenix
- (2) 1/8" stereo Male to RCA Male (you can buy this specific cable, or use a RCA Male-Male cable with an adapter)

Gentner Phoenix Wiring

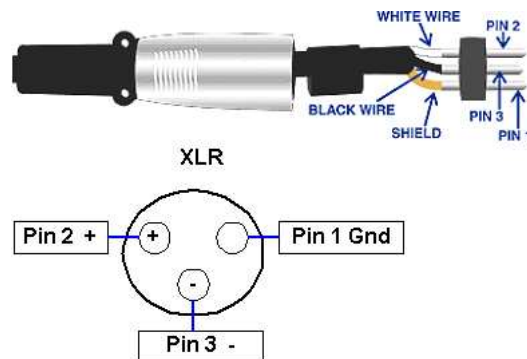
The left terminal is + (red), middle terminal is - (black), right terminal is shield (uninsulated, ground), as follows:



1/8 inch Stereo Plug



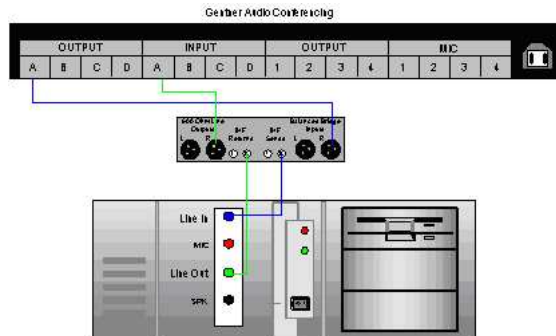
XLR Connector Wiring Diagram



Pin 1 = shield (ground) Pin 2 = White or Red (+ or "hot") Pin 3 = Black (-)

1. Connect an "XLR Male to Gentner Phoenix" cable to the "Balanced Bridging Line inputs R" connector, and the other end to Gentner Output A.
2. Connect an "XLR Female to Gentner Phoenix" cable to the "600 Ohm Line Outputs R" connector, and the other end to Gentner Input A.

3. Connect an "1/8" stereo Male to RCA Male" cable (or cable/adaptor combination) to the "IHF Sends R" connector, and the other end to the "Line In" connector on your audio machine's sound card. This connector is the top, blue connector on the SoundBlaster PCI 128 card.
4. Connect an "1/8" stereo Male to RCA Male" cable to the "IHF Returns R" connector, and the other end to the "Line Out" connector on your audio machine's sound card. This connector is the third from the top, green connector on the SoundBlaster PCI 128 card.



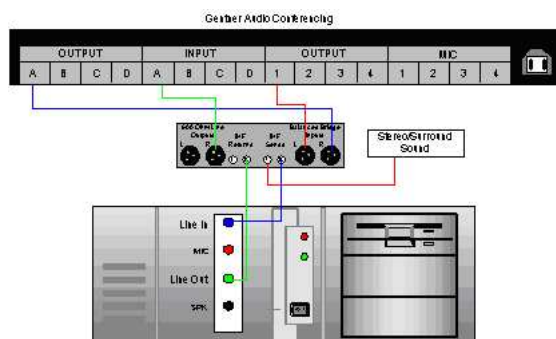
Sound System Connections

The connections required for proper installation of the sound or speaker system will depend on the type of equipment being used. The Gentner Audio Conferencing system is a balanced device which utilizes positive and negative leads as well as a ground. Most surround sound or stereo systems do not support this type of termination and will require the MM100 to be utilized to convert the balanced signal to an unbalanced signal.

Configuration for Unbalanced connection to Speaker System

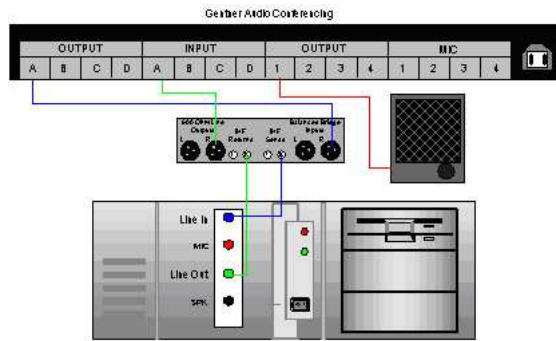
If you are using a Stereo or Surround Sound Receiver/Amplifier you will need to connect the MM100 Matchmaker in line to convert the balanced Gentner output to an unbalanced signal for the receiver.

1. Connect an "XLR Male to Gentner Phoenix" cable to the "Balanced Bridging Line inputs L" connector, and the other end to Gentner Output 1.
2. Connect an "RCA Male to RCA Male" cable to the "IHF Sends L" connector, and the other end to your amplifier or amplified speaker's "Line In" connector. You may want to use a RCA Female to two RCA Male Y-cable if you have a stereo amplifier (the Access Grid is monaural for now).



Configuration for Balanced connection to Speaker System

For a balanced system, such as the Genelec Amplified Speaker, connect the "Output 1" (or others as needed) directly to the balanced input of the device.



Microphone Connections

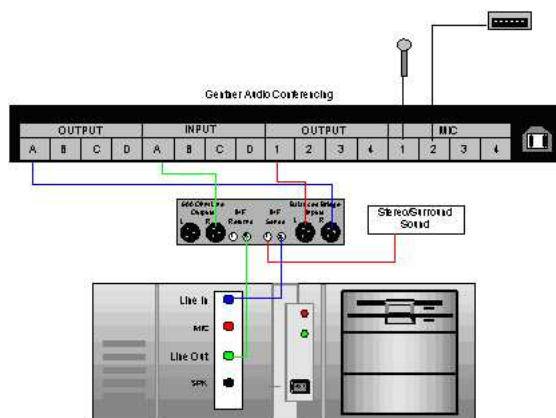
There are two types of microphones being used in the Access Grid system, ambient and directional. The ambient microphones are used to pick up the voices of multiple people within the room. The ambient microphone has a low profile and inconspicuous design and can detect the sounds of the room over a wide area. This gives the audience a sense of talking to the distant parties directly rather than focusing their attention on the microphone. The distant end participants will hear all of the parties in the audience as if they were all in the same room, without each participant requiring their own microphone or allowing one user to dominate.

Directional microphones are used for single users or presenters whose speech will be the main focus of the event. The microphones are also used to supplement the ambient microphones for acoustically difficult areas of the room.

Placement of the microphones is critical in ensuring a high quality collaborative environment. Ambient microphones which are too close to noise generating devices such as equipment fans, PA speakers, walkways etc, will pick up the background noise which will disrupt and distract other AG participants at the distant end. Participants at the sending site subconsciously "turn off" background noise, but the users at the remote sites will be annoyed since this background noise will be amplified to the same level as the participants voices.

Microphone connections are made to the "Mic Input" on the Gentner Audio Conferencing Device. The position that the microphone is placed on the Gentner device is not important but needs to be noted so that the proper settings may be applied within the Gentner Audio Conferencing device.

1



Final Configuration

Gentner Initial Configuration

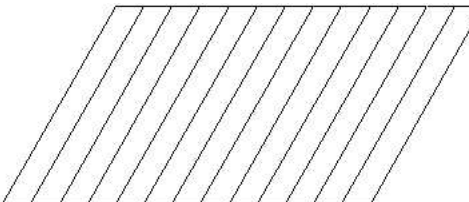
The Gentner Audio Conferencing device controls and cross connects the audio streams generated by the microphones and Audio Server. This device performs echo cancellation, gain control, cross connects the input and output feeds, and powers the microphones. The device also can utilize a dial up line to support an alternate method of communication in case of network trouble. The following presets are a recommended starting point to begin tuning the Gentner for proper sound quality. In addition to the adjustments available, placement of the microphones and speakers is critical.

The following information is intended to get the user started and initially configure the Gentner system. Please refer to the Gentner manual for additional information and detailed instructions for fine-tuning your system.

Matrix Configuration

The Gentner system uses a basic X/Y grid to cross connect the input and output signals, which is accessed by clicking on the Matrix point on the main page. The configuration below depicts an example of the connections used for normal operation with an AP400 system. These points correspond with the connection points depicted in the earlier drawings. If the deployed system has greater or fewer devices connected, ensure the proper cross connections are made for your system. You may wish to use the document "How to Configure the Gentner AP400 for Use on the Access Grid" installed in the User Documentation of the 1.0 Access Grid Toolkit, and available online².

The cross connect is laid out with the inputs on the vertical and the outputs laid out across the horizontal axis. Checking the corresponding box for the connection points desired instructs the Gentner device to make a logical connection between the input and output. The Gentner will then send all of the signals from the input to the corresponding outputs. (A simple way to test your configuration through the Gentner device would be to cross connect your microphone inputs directly to your speaker outputs by checking the box between the "mic 1" and the "input 1".)



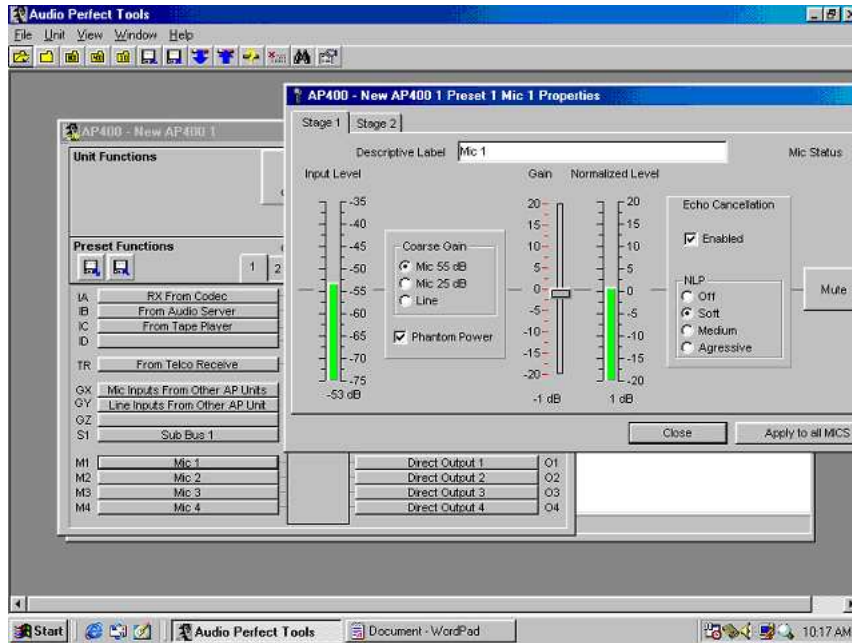
ROUTING MATRIX SETUP		Outputs					G-Link			Sub Bus	Outputs								
		A	B	C	D	T	X	Y	Z		1	2	3	4					
	Input A																		
	Input B																		
	Input C																		
	Input D																		
	Telco Receive						■												
	G-Link X Bus							■											
	G-Link Y Bus								■										
	G-Link Z Bus									■									
	Sub-bus										■								
	Mic / Line 1*																		
	Mic / Line 2*																		
	Mic / Line 3*																		
	Mic / Line 4*																		
		*Inputs 1-4					G=Gated			N= Non gated									

Echo Cancellation setup	Outputs				Outputs				G-Link EC Ref
	A	B	C	D	1	2	3	4	
Define EC Ref & PA (Speaker Output)									
Define G-Link EC Ref									

AP400 Matrix

Device Levels

The gain control for the inputs and outputs need to be tailored to your environment and specific equipment. While monitoring normalized level audio meter view in the Gentner control panel, adjust the gain so that the mean level being received by the Gentner is at 0 db for normal conversation. A good starting point for the gain setting is around -7 db. At this level the system will have the proper power needed to obtain a good signal while not distorting the voice or allowing high levels of feedback. Check and adjust the audio levels at all points of the audio path starting at the mic level, bus level, tx to codec, tx to telco, rx from codec, rx from telco and on the PC at the RAT.



Microphone levels

Additional consideration must be taken for the adjustment of the microphones since their placement relative to the speakers and source will affect sound quality. If the microphones are too close to the speakers, the gain control will need to be reduced so that excess feedback does not cause acoustic feedback or "squealing" of the system. To compensate for the lower levels, adjustments to the outgoing signal from the Gentner or the incoming signal at the distant end may be required.

Notes

1. Ambient microphones convey audio that is produced in wide area as opposed to a directional microphone that picks up sounds from a specific area.
2. <http://www.accessgrid.org/agdp/howto/config-gentner-ap400.html>

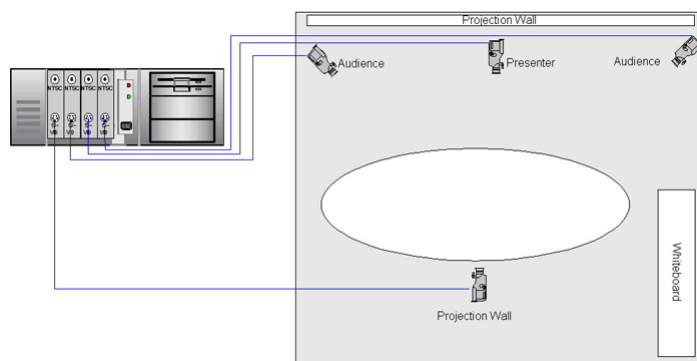
Chapter 6. Video System

The video capture system consists of cameras and a video server which converts the video image into an IP stream for transport over the network. The system uses multiple camera angles to provide an environment that simulates physically being in the room as opposed to a videoconference's talking-head delivery. The placement of the cameras is a critical piece to providing a compelling environment for collaboration and is covered in more detail in the Room Configuration section.

Camera Placement

The size and intended use of the room will determine the number of cameras and their placement. For a typical node location, three cameras are used to provide coverage of the environment.

1. Presenter - This camera is used to provide a front view of the participants or presenter and should be placed facing the audience and in as direct a line of site as possible to the projected image. This placement will give the impression of the local group looking directly at the remote group when the remote groups image is placed on the projection wall. This image will also be the main focus point for the remote audience and provides the most direct interaction.
2. Primary / Secondary Audience - This camera is used to give an additional view of the audience and more detail of the surrounding environment.
3. Projection Wall - This camera provides a view of what the local users are viewing to the other participants in the session. This also provides a view that completes the image of the room.
4. Additional Cameras - Additional cameras may be added to provide better coverage of the room or help to complete coverage of the space provided.



The cameras are connected to the Video Server via "S" Video cables to the Wintv 125 Dbx TV Stereo 125 channel video card. The order in which the cameras are connected to the video cards is not important for setup but should be annotated for use during operation.

Note: See the camera's operation manual for operating instructions.

Chapter 7. Display System

The display system is made up of a display server running Windows 2000 with a Multiple Display adapter, and a projector system that supports a large display field. The number of projectors will be determined by the size of the available viewing area but three is the suggested minimum to supply the proper amount of real estate. The system may use a front mount or rear mount projection system depending on room configuration, budget and room use. Rear projection systems are generally more expensive and take up more space, but do provide a cleaner presentation and superior image quality.

Mount the projectors as required by the particular style of projector being used. Ensure that the projectors are level and spaced properly for the room. Once the projectors are installed and operational adjust focus, zoom and keystone as required. See your projector's manual for details.

Chapter 8. Network Configuration

The ability to collaborate successfully over the Access Grid will depend in a large part on the network supporting it. The network must be reliable, have sufficient bandwidth to all participants in a meeting and support multicasting. For most applications the use of a private network will allow this to be easily configured and supported, while the use of the Internet creates special challenges that will need to be addressed.

Since it is not possible for to know the network configuration and topology of the users network while writing this document, the following information should be viewed as a guide only. It is strongly recommended that you allow networking personnel to assist in analyzing and configuring the network to help ensure proper operation.

Bandwidth Considerations - The access grid system allows for adjustments of the video and audio streams to allow for operation in a wide range of networking environments. The quality level of the video and audio streams are directly related to the amount of bandwidth that used during a session, the higher the quality desired the more bandwidth consumed.

Considerations for the bandwidth must take into account the number of locations desired to be up at any one time. The Access Grid works on a peer-to-peer relationship and all users will stream to all other users active in the session. A session with four locations and four cameras per location would be streaming twelve video and three audio streams into each participant. If each video stream was sending at 256Kb, and each audio stream was taking up 128Kb, each location would need to be able to support 3456Kb in order to participate successfully in the meeting. This number represents the maximum bandwidth being consumed and the actual amount at any one time would be lower since the video codecs only send changes of the image and not the entire image. This means that a room with little motion will have high quality images on little bandwidth while a room with many changes will consume more bandwidth and may have poorer quality.

Additionally all of the cameras do not send information at the same rate. Since they only send what has changed in their respective views, the motion in their area of coverage will dictate their consumed bandwidth. This means that the cameras can utilize an overall lower speed pipe by sharing the bandwidth as needed. It would be rare that all of the streams would be using maximum rates at the same time as in our example above.

Hardware Considerations

In order for the Access Grid to support multiple site collaboration, multicasting is employed to facilitate the delivery. Multicasting allows for a single output stream to be "branched off" to multiple locations and sent only to the locations requesting the service. This greatly reduces bandwidth and helps to ensure all parties receive the same information at similar times. In order to accomplish this the underlying network must be multicast enabled, starting at the switches closest to the node and moving out to the edge and core routers/switches. A thorough examination of the network must take place to determine if the existing equipment is capable of supporting multicasting and what, if any updates are required.

Chapter 9. Equipment Specifications

The equipment specifications for creating an Access Grid Node can be found at the Access Grid Tech Resources¹ web page.

Notes

1. <http://www.accessgrid.org/agdp/guide/spec.html>

