

# Polycom<sup>®</sup> Solutions Architecture

Typical Applications for Vortex<sup>®</sup> Products with  
Other Installed A/V Equipment

Application Note  
Polycom Installed  
Voice Business

April 2005



# Polycom® Solutions Architecture

This document provides some example installed voice and video solutions for different types of applications including small and large conference rooms, courtrooms, and classrooms. While a particular customer's room configuration and solution may differ from these examples, the requirements and capability for a particular room will be similar.

## 1 Small to Medium Sized Meeting Room (200-400 square feet)

The enterprise small to medium meeting room is used both as a local collaboration space and also for conferencing with remote team members. There is typically a conference table with seating for from 6 to 12 participants with a total room size of approximately 200 to 400 square feet and a 9 foot ceiling.

### 1.1 Conferencing Requirements

This meeting room requires at least audio conferencing and possibly video conferencing systems along with data collaboration for sharing powerpoint presentations, spreadsheets, and other documents.

This style of meeting room will have between 4 and 8 microphones (total) and a loudspeaker for each 100-200 square feet of room.

### 1.2 Block Diagram and Description

One solution for this room is shown in Figure 1. In this example, two loudspeakers are installed into the ceiling and 4 microphones are installed on the table. Also on the table is a SoundStation VTX 1000™, and a Vortex® EF2241, VSX™ 7000 video codec, and Visual Concert can be installed in the room.

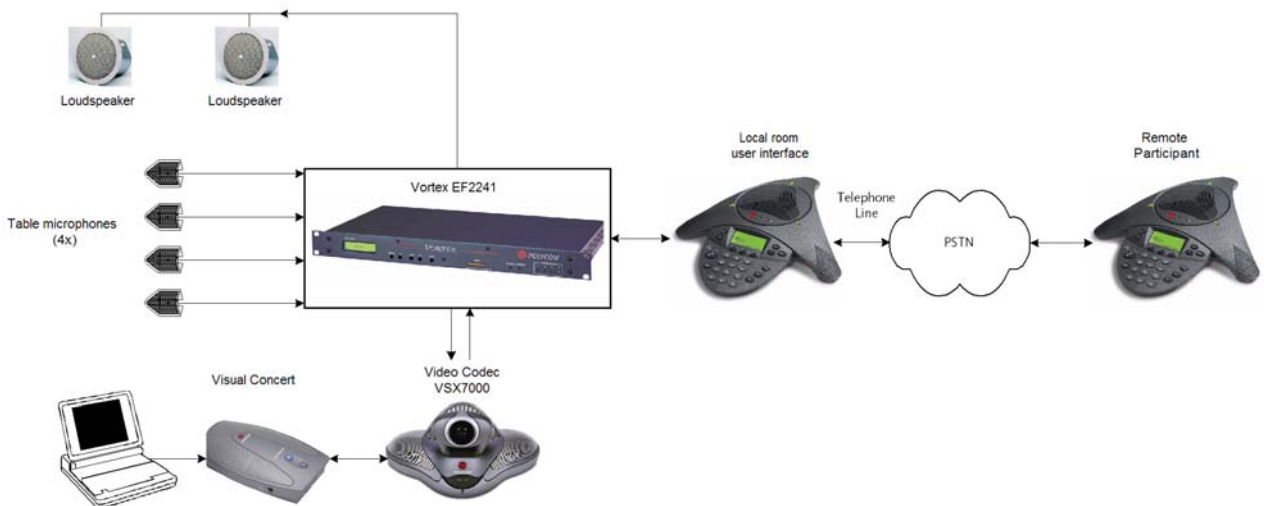
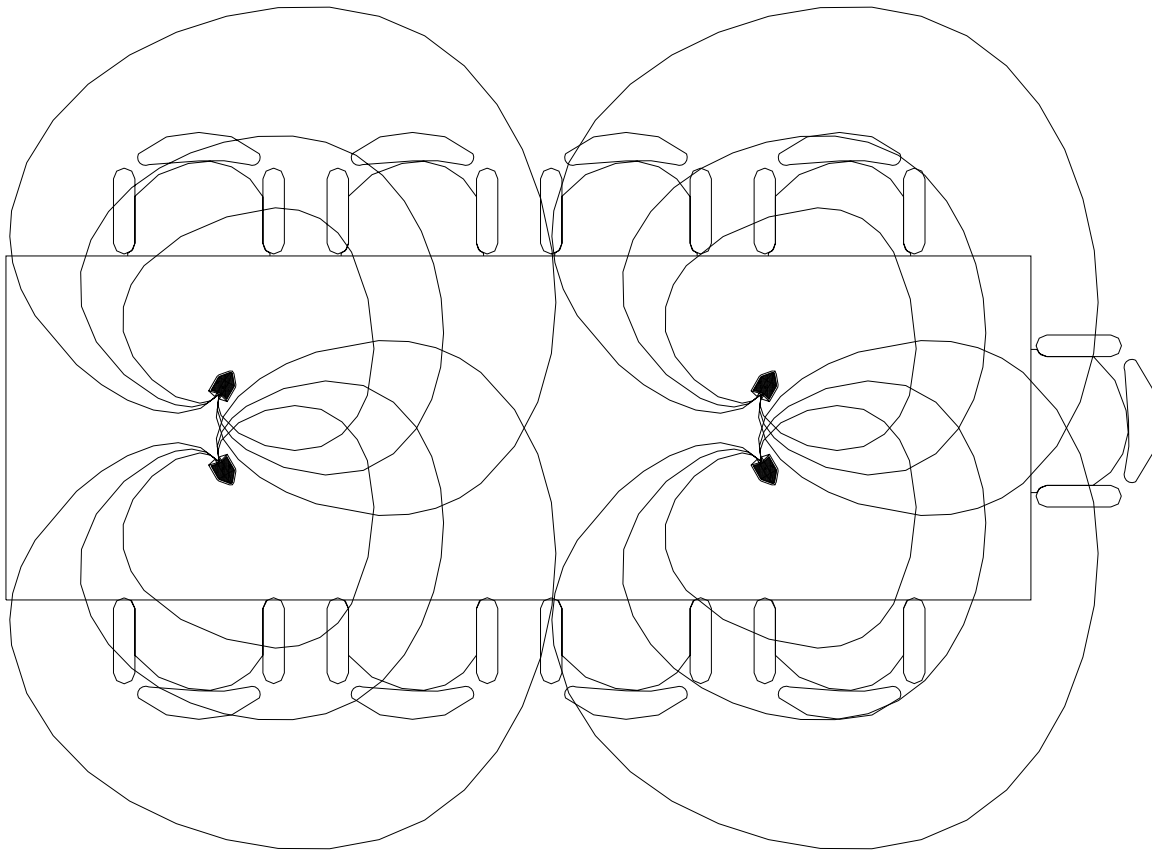


Figure 1. Small meeting room audio and video solution.

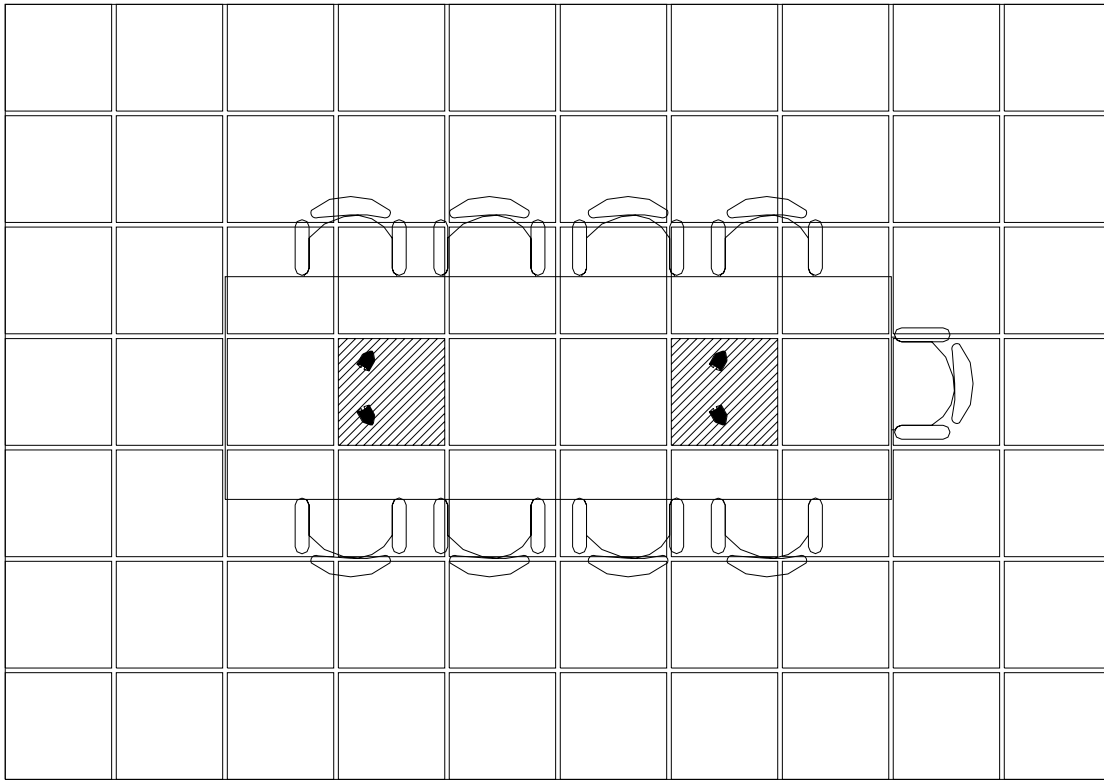
The microphone audio is sent to the Vortex EF2241, echo cancelled, noise cancelled, and then is routed to both the video codec and the SoundStation VTX 1000. The SoundStation VTX 1000 can be used to dial remote participants over the PSTN network and can provide either wideband communication when

connected remotely to another SoundStation VTX 1000 or traditional narrow band telephone otherwise. The SoundStation VTX 1000 is the user interface to dial and initiate audio conferences.

Four table top boundary microphones are distributed across the table. As shown in Figure 2, each microphone has a cardioid pattern that will pick up the talker in front of it while rejecting sound from behind the microphone. Loudspeakers in this room can be attached directly to the Vortex EF2241's 10W amplifier and positioned over the table as shown as the cross hatched areas in Figure 3. In this example, the loudspeakers fit directly into the 2'x2' ceiling tile locations to simplify installation of the system.



**Figure 2. Typical microphone layout and pick up pattern for audio and video conferencing in a small meeting room.**



**Figure 3. Ceiling speaker location for the typical small to medium sized meeting room. Two 2'x2' loudspeaker ceiling tiles are shown installed over the table fitting within the standard 2'x2' ceiling tile array.**

### 1.2.1 Equipment List

- 1 Polycom Vortex EF2241 (supports 4 microphones)
- 1 Polycom SoundStation VTX 1000
- 4 Table top boundary microphones with cardioid pattern
- 2 Ceiling tile 2'x2' loudspeakers
- 1 Polycom VSX 7000
- 1 Visual Concert FX

} Can be purchased as a Quick Install Pack

The Polycom Quick Install Packs 1 or 2 will provide a turn key solution for this application by including four tabletop boundary microphones, a SoundStation VTX 1000, two ceiling loudspeakers, and all the appropriate cabling to connect the microphones, loudspeakers, and Vortex EF2241 to the VSX 7000 video codec and to the SoundStation VTX 1000.

Alternatively, ceiling microphones can be used where it is a requirement to keep the table clear or when different furniture layout requirements. When using ceiling microphones, care must be taken to maintain a reasonable physical separation between the ceiling microphones and the ceiling loudspeakers to prevent the loudspeaker audio from coupling directly into the ceiling microphones.

## **1.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The files for this example are labeled:

small-room-example.idt (InstantDesigner Template)

small-room-example.ccp (Conference Composer Project file)

## **2 Large Meeting Room (400-1200 square feet)**

The typical large meeting room is used for formal presentations, group meetings, and for collaboration with larger teams. There is typically a conference table with distributed seating that holds from 10 to 20 participants, perhaps more with overflow seating, and a total room size of approximately 400-1200 square feet, typically with a 9 foot high ceiling.

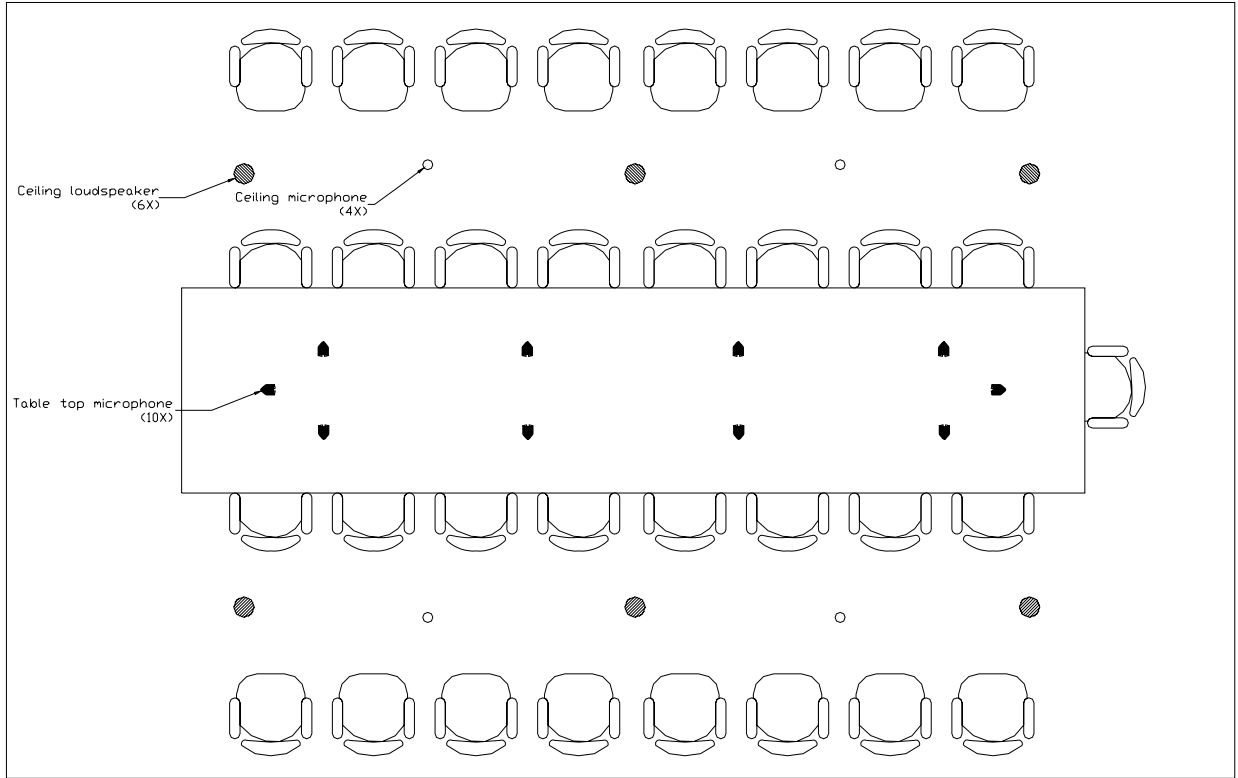
### ***2.1 Conferencing Requirements***

The large meeting room typically requires an audio and video conferencing system along with data collaboration, program audio and video (such as DVD or VCR) for audio and video playback. There may also be a touch panel for controlling the lighting, a/v sources, and the conferencing devices. Multiple phone lines may be required to allow several remote participants to dial into the system simultaneously, and in the larger rooms, wireless microphones may be used for presenters so they can be clearly heard by all participants (local and remote).

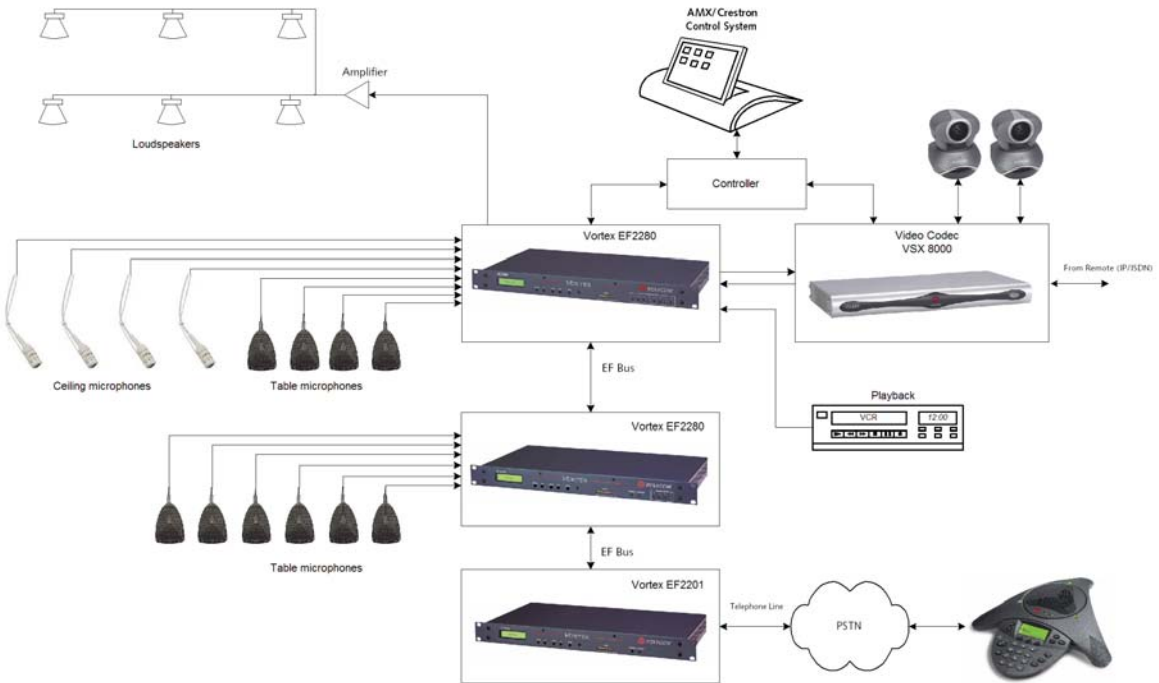
This style of meeting room will have between 6 and 20 microphones (total) including overflow microphones and a loudspeaker for each 100-200 square feet of room. A sample room layout is shown in Figure 4.

### ***2.2 Block Diagram and Description***

One solution for this room is shown in Figure 5. The solution consists of ten boundary tabletop microphones, four ceiling microphones for overflow seating, six ceiling loudspeakers, two Vortex EF2280's, a Vortex EF2201, room controller and touch panel, VCR or DVD, and a VSX 8000 video codec with two PowerCams.



**Figure 4. Large room configuration with 10 table microphones, 4 ceiling microphones for overflow seating, and six ceiling loudspeakers for full room coverage.**



**Figure 5. Large sized meeting room block diagram.**

## **2.2.1 Equipment List**

A typical installation may include equipment such as the following list.

- 2 Polycom Vortex EF2280s (support 8 microphones each)
- 1 Polycom Vortex EF2201 (supports one telephone line)
- 10 Table top boundary microphones with cardioid pattern
- 4 Ceiling microphones (hanging microphones with cardioid pattern)
- 6 Ceiling loudspeakers (70V)
- 1 audio amplifier (70V, less than 100 watts)
- 1 Polycom VSX 8000
- 2 Powercams for VSX 8000
- 1 AMX or Crestron touch panel
- 1 AMX or Crestron controller

## **2.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The files for this example are labeled:

- large-room-example.idt (InstantDesigner Template)
- large-room-example.ccp (Conference Composer Project file)

### **3 Large Meeting Room with Sound Reinforcement (800 – 2000 square feet)**

Large meeting rooms may also have sound reinforcement, also known as voice lift, to enable the local participants to be heard clearly by all the other local participants. Sound reinforcement adds a portion of the local microphone signals into the local loudspeakers of other areas of the room. There is typically a conference table with distributed seating that holds from 10 to 40 participants, perhaps more with overflow seating, and a total room size of approximately 800-2000 square feet with a 9 foot high ceiling.

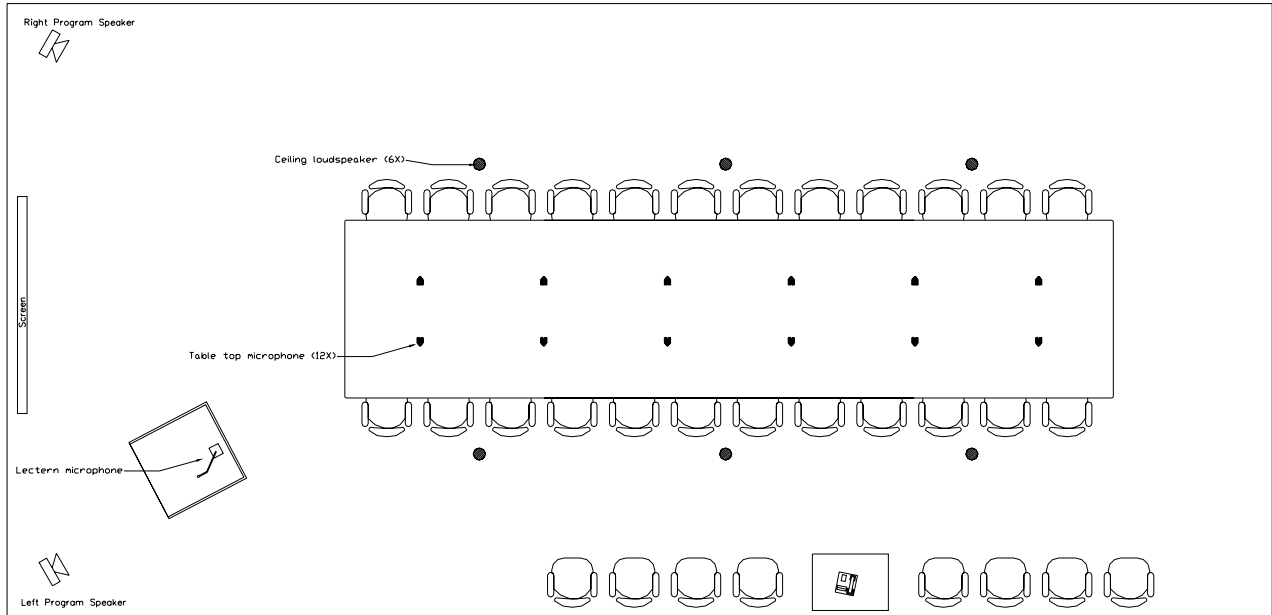
#### ***3.1 Conferencing Requirements***

The large meeting room with sound reinforcement will usually have an audio and video conferencing system along with data collaboration, program audio and video (such as DVD or VCR) for high quality audio and video playback. There may also be a touch panel for controlling the lighting, a/v sources, and the teleconferencing devices. Multiple phone lines may be required to allow several remote participants to dial into the system simultaneously, and in the larger rooms, a lectern with a podium microphone and wireless microphones may be used for presenters so they can be clearly heard by all participants (local and remote).

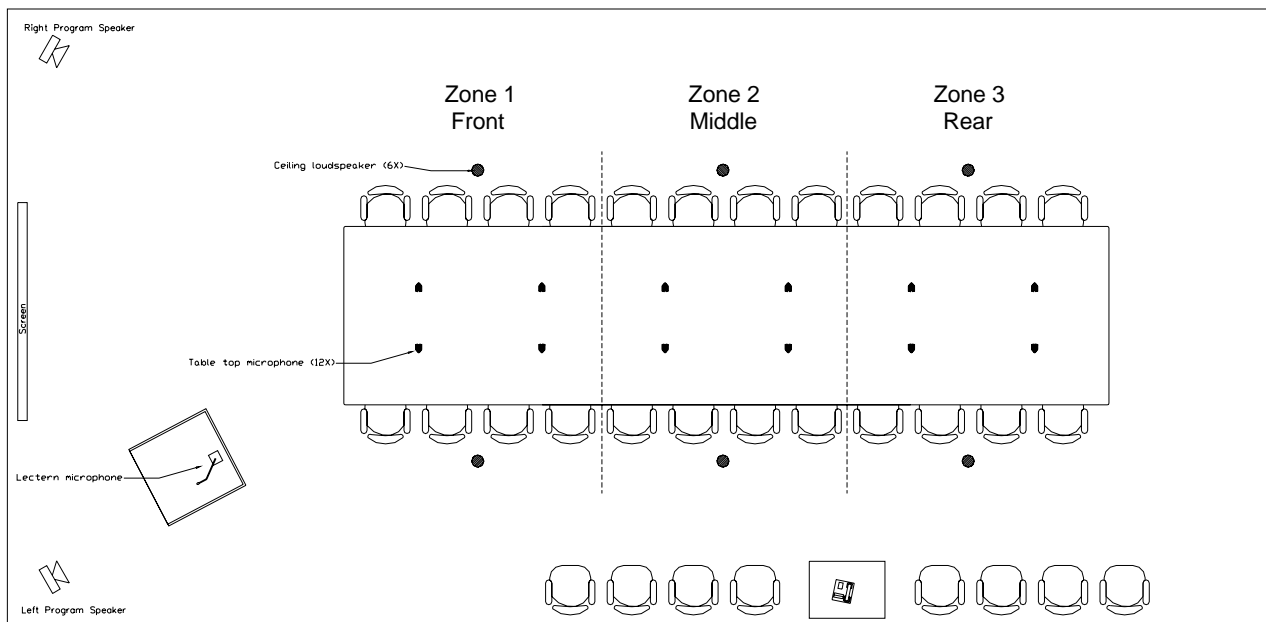
This style of meeting room will have between 10 and 30 microphones (total) including overflow microphones and a loudspeaker for each 100-200sq feet of room. A sample room is shown in Figure 6, with sound reinforcement zones shown in Figure 7.

#### ***3.2 Block Diagram and Description***

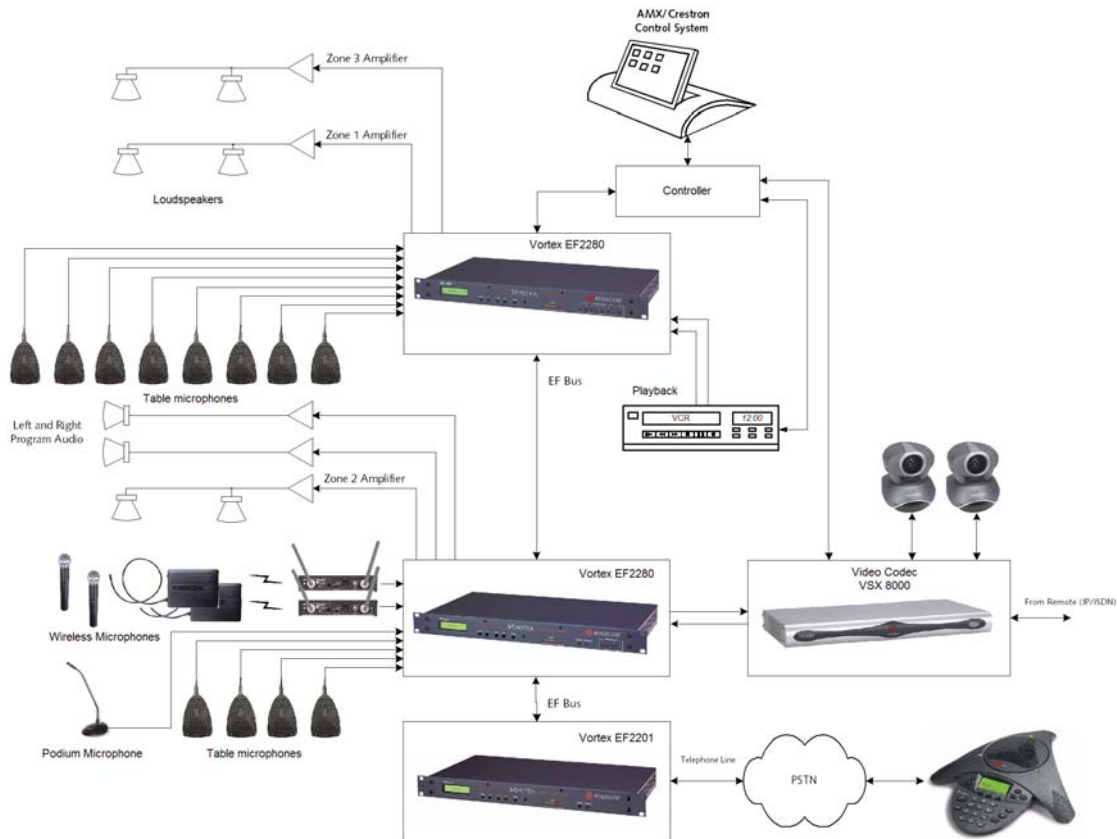
One solution for this room is shown in Figure 8. The solution consists of twelve boundary tabletop microphones, a podium with lectern microphone, six ceiling loudspeakers, separate program audio for left and right, two Vortex EF2280's, a Vortex EF2201, room controller and touch panel, VCR or DVD, and a VSX 8000 video codec with two PowerCams.



**Figure 6.** Large room configuration sound reinforcement with 12 table microphones, a podium with lectern microphone, six ceiling loudspeakers for full room coverage, and program audio left and right loudspeakers at the front of the room.



**Figure 7.** Large room configuration sound reinforcement of Figure 6 showing three zones of sound reinforcement.



**Figure 8. Block diagram for the large sized meeting room with sound reinforcement.**

### 3.2.1 Equipment List

A typical installation may include equipment such as the following list.

- 2 Polycom Vortex EF2280s (support 8 microphones each)
- 1 Polycom Vortex EF2201 (supports one telephone line)
- 12 Table top boundary microphones with cardioid pattern
- 2 Wireless microphones and receivers
- 1 Podium microphone with cardioid pattern
- 6 Ceiling loudspeakers (70V)
- 2 Program audio loudspeakers (70V)
- 1 audio amplifier with at least 5 independent channels (70V, less than 60 watts per channel required)
- 1 Polycom VSX 8000
- 2 PowerCams for VSX 8000
- 1 AMX or Crestron touch panel
- 1 AMX or Crestron controller
- 1 Stereo VCR or DVD

### **3.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The files for this example are labeled:

large-room-with-sr-example.idt (InstantDesigner Template)

large-room-with-sr-example.ccp (Conference Composer Project file)

## **4 Executive Board Room**

The executive board room is used for formal presentations to senior managers, investors, analysts, and board members. The executive board room plays a central role in corporate planning, communications, and strategy. Since the room is generally used most by senior executives, there is an overwhelming requirement for reliability, simplicity, and absolute performance. Board rooms typically vary in size from approximately 600 sq ft to more than 4000 sq ft with at least a 9 foot, and often higher, ceiling. In the larger rooms there may be sound reinforcement to ensure that all participants can be heard clearly by the other local participants. Typically there is some acoustic treatment that matches the décor of the room applied to the walls to improve the overall audio quality of the room.

### ***4.1 Conferencing Requirements***

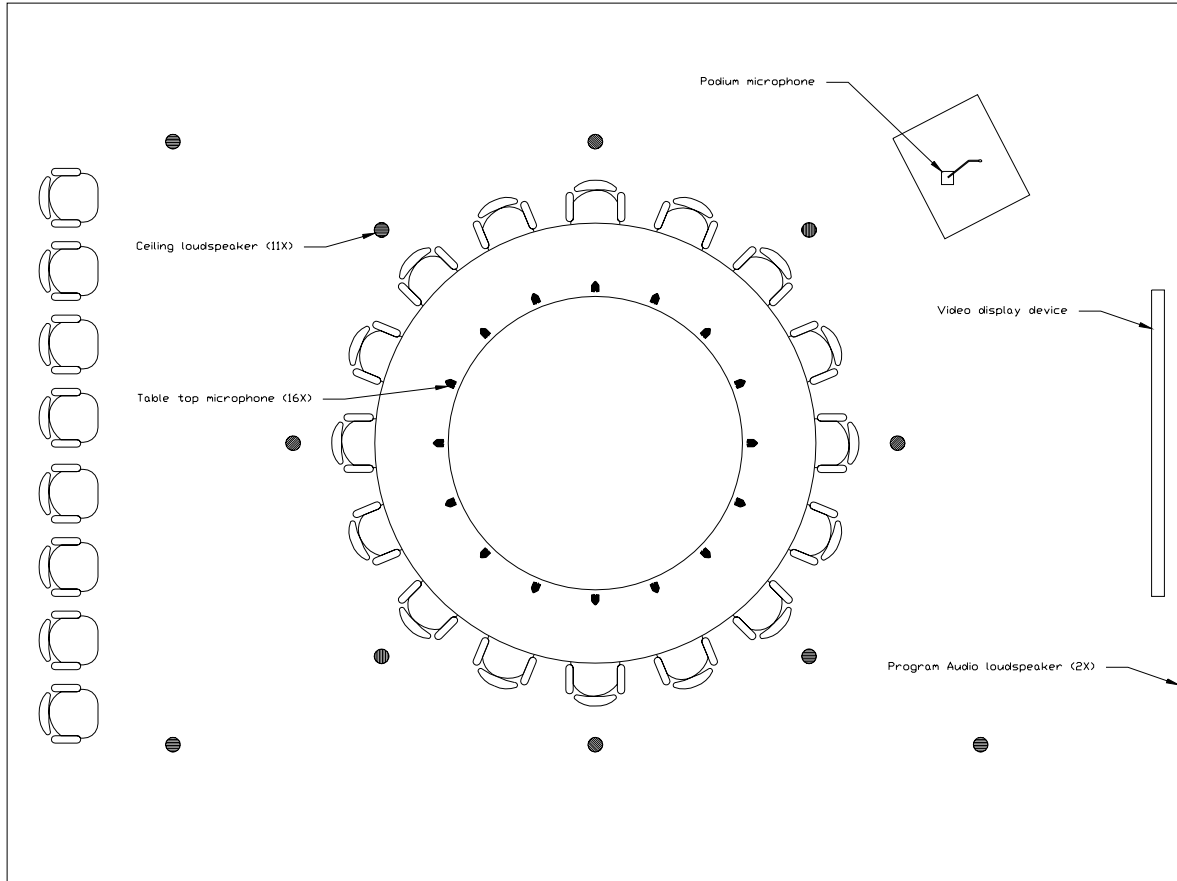
The executive board room requires audio and video conferencing system along with data collaboration, program audio and video (such as DVD or VCR) for audio and video playback, and large projection display of multiple video sources as well as computer data. Multiple phone lines may be required to enable different remote participants to dial into the system, there may be multiple computer locations that are able to display onto the data screens, and there will be Ethernet interfaces around the table. Providing clear and consistent levels of voice pickup and voice reinforcement is critical to the successful board room application as different board members have varying speech levels from the soft spoken to the booming.

In rooms with high ceilings (above 10 feet) or architecturally designed ceilings, in-ceiling speakers may not be an option and other alternatives must be explored such as in-table loudspeakers that are zoned for each conference participant.

This style of meeting room will typically have between 6 and 32 microphones (total) including overflow microphones, a ceiling loudspeaker for each 100-200 sq ft of room, and program audio loudspeakers that enable stereo (or even surround sound) reproduction of CD, VCR, and DVD audio.

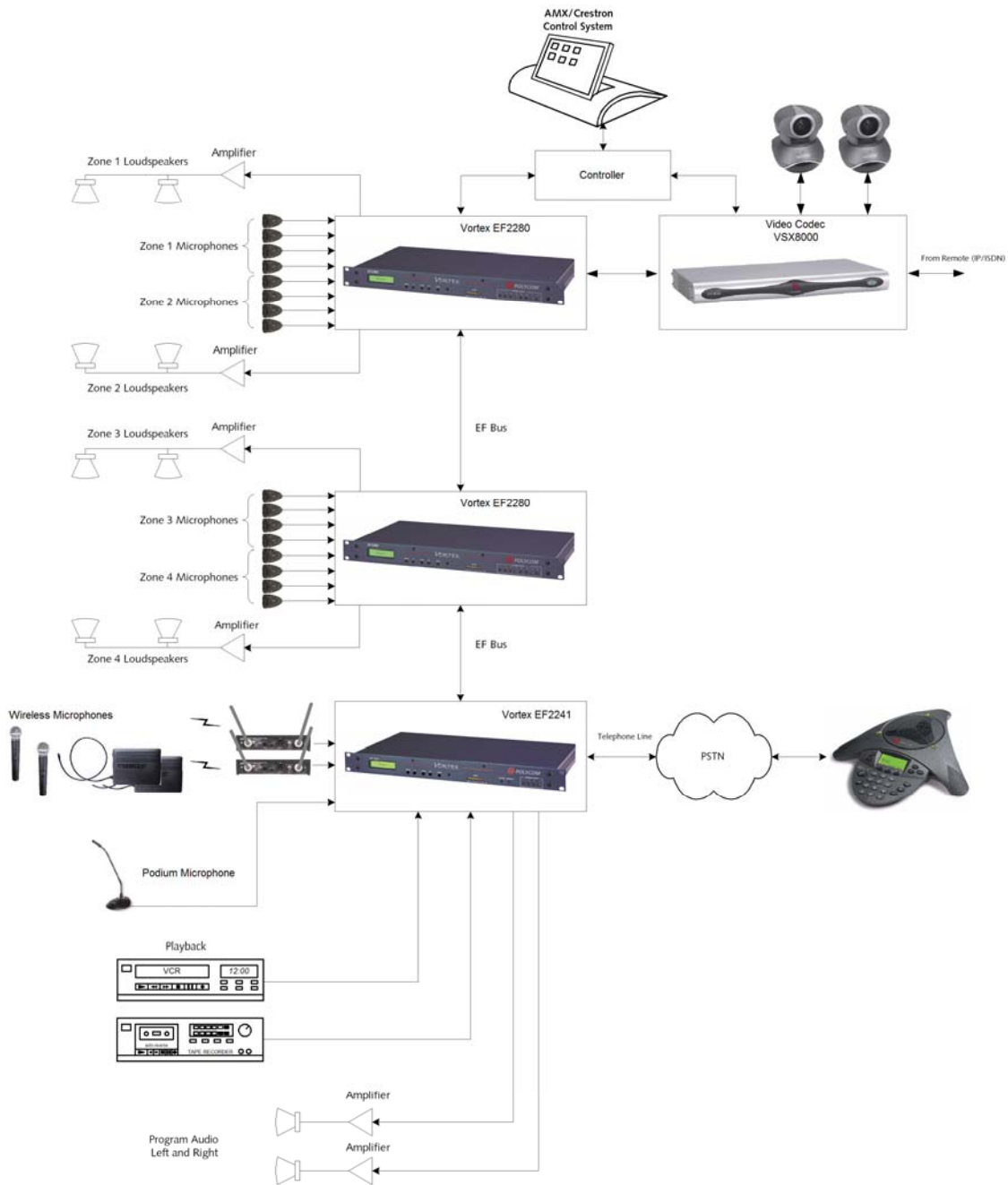
### ***4.2 Block Diagram and Description***

One solution for this room is shown in Figure 9. The solution consists of sixteen boundary tabletop microphones, eleven ceiling loudspeakers, two Vortex EF2280's, a Vortex EF2201, room controller and touch panel, VCR or DVD, and a VSX 8000 video codec with two PowerCams.



**Figure 9. A sample board room layout with 16 tabletop microphones, 11 ceiling loudspeakers, program audio, and overflow seating.**

The complete design for this room would include the definition of the different loudspeaker zones and a summary of which microphones should be placed in those zones.



**Figure 10. Typical board room system design including four audio zones.**

### 4.2.1 Equipment List

A typical installation may include equipment such as the following list.

- 2 Polycom Vortex EF2280s (supports 8 microphones each)
- 1 Polycom Vortex EF2241 (supports up to 4 microphones one telephone line)
- 16 Table top boundary microphones with cardioid pattern

- 2 wireless microphones for presenters
- 1 podium microphone
- 11 Ceiling loudspeakers (70V) in 4 zones
- 1 Stereo loudspeaker pair (70V or 8 Ohm)
- 1 6-zone (including stereo program audio material) audio amplifier (70V, less than 100 watts)
- 1 Polycom VSX 8000
- 2 PowerCams for VSX 8000
- 1 AMX or Crestron touch panel
- 1 AMX or Crestron controller

#### **4.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The files for this example are labeled:

- board-room-example.idt (InstantDesigner Template)
- board-room-example.ccp (Conference Composer Project file)

## **5 Court Room**

Court rooms are rapidly being transformed with technology that enables judges to use touchscreen interfaces to control audio within the courtroom, view evidence exhibits, control what the jurors hear and view, control projection screens, and initiate audio and video conferencing. These systems may be tied to video arraignment systems that enable the judges, attorneys, and defendants to see and hear everyone without physically moving the defendants to the courtroom.

### **5.1 Conferencing Requirements**

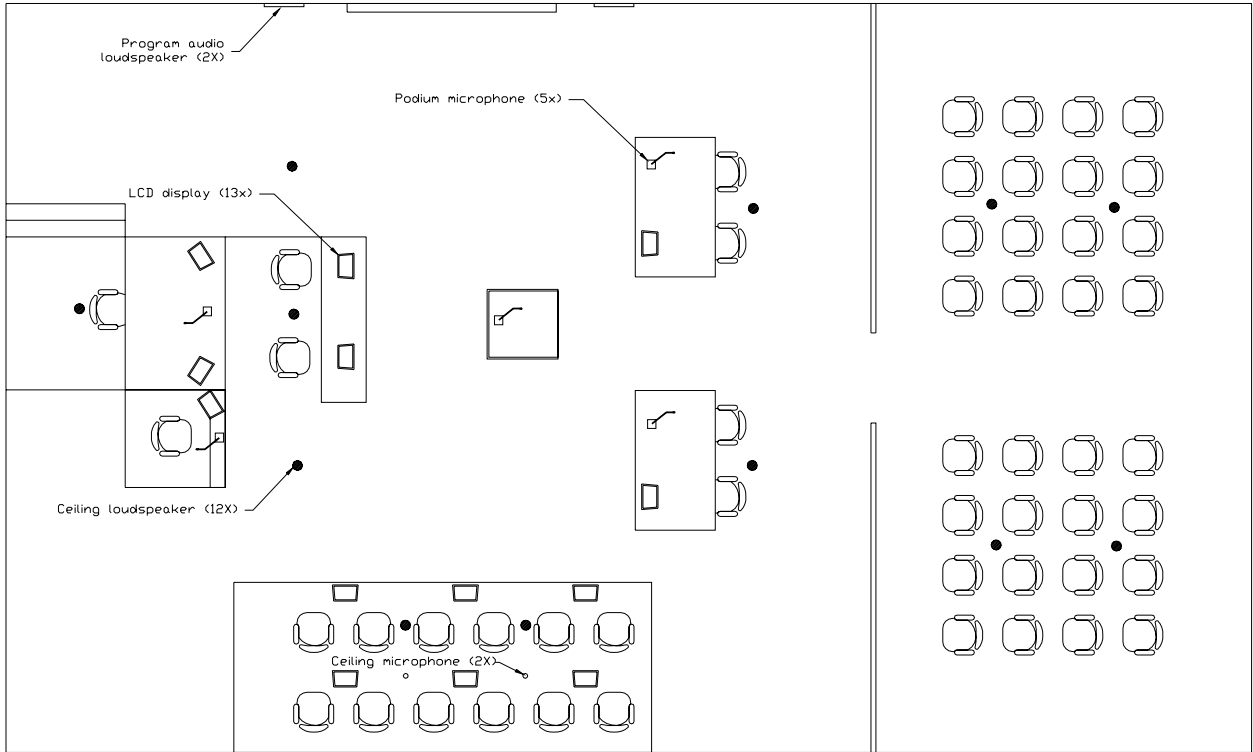
The court room has requirements for audio and video conferencing and sound reinforcement capabilities that are similar to large room conferencing requirements. In addition, the proceedings are recorded into a multi-channel recorder for archival and legal purposes. Judges have the ability to change the audio routing and play noise masking to the jury loudspeakers so that sidebars with attorneys are not overheard.

### **5.2 Block Diagram and Description**

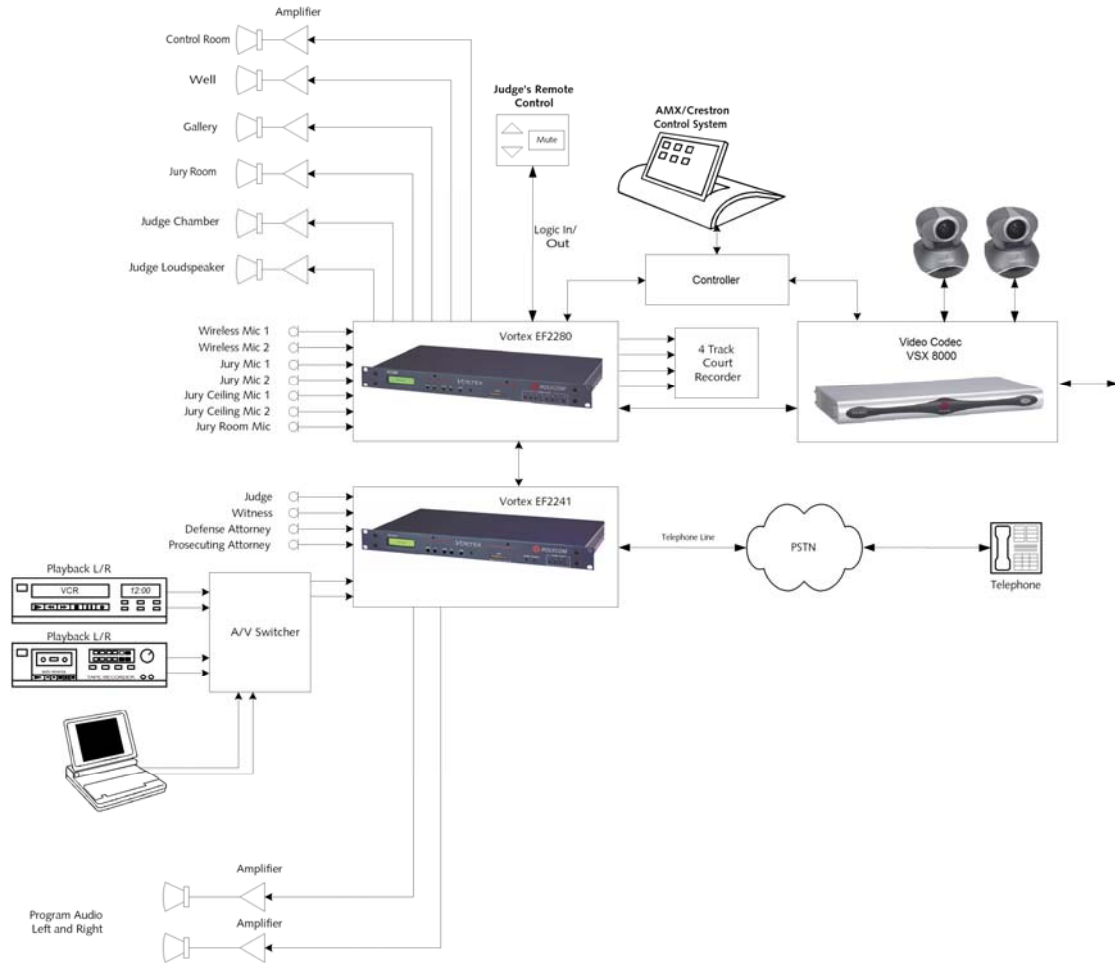
A typical court room application, as shown in Figure 11, includes gooseneck microphones for the judge, witness, attorneys and possibly a presenter's microphone. There may also be ceiling microphones in the jury box, in the jury room, and also in the judge's chambers (for judge/attorney meetings).

There will be loudspeaker zones for the gallery, the attorneys, the jury, the well area in front of the judge's bench, and a loudspeaker specifically for the judge.

There may be several options for program audio and video such as from VCRs, CD players, and DVD player.



**Figure 11. Typical court room layout with Judge, witness, attorney and jury microphones.**



**Figure 12. System design for a typical court room application.**

## 5.2.1 Equipment List

A typical installation may include equipment such as the following list.

- 1 Polycom Vortex EF2280 (supports 8 microphones)
- 1 Polycom Vortex EF2241 (supports 4 microphones and one telephone line)
- 9 Podium/gooseneck microphones with cardioid pattern
- 2 Wireless microphones and receivers
- 12 Ceiling loudspeakers (70V)
- 2 Program audio loudspeakers (70V)
- 1 audio amplifier with at least 8 independent channels (70V, less than 60 watts per channel required)
- 1 Polycom VSX 8000
- 1 Multi track recorder
- 2 PowerCams for VSX 8000
- 13 LCD display panels (optional)
- 1 AMX or Crestron touch panel

- 1 AMX or Crestron controller
- 1 Stereo VCR or DVD
- 1 A/V switcher
- 1 Stereo tape or CD player

## **5.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The Conference composer file for this example is labeled courtroom-example.ccp (Conference Composer Project file)

## **6 Classroom**

The typical class room application (distance learning, corporate training, and traditional classroom) will have a central location for presenters with multiple rows of seating, possibly in a tiered configuration in the larger rooms. There is a requirement for the instructor to be heard well locally (in room reinforcement), for students to be able to interact with remote participants, and for data collaboration tools.

### **6.1 Conferencing Requirements**

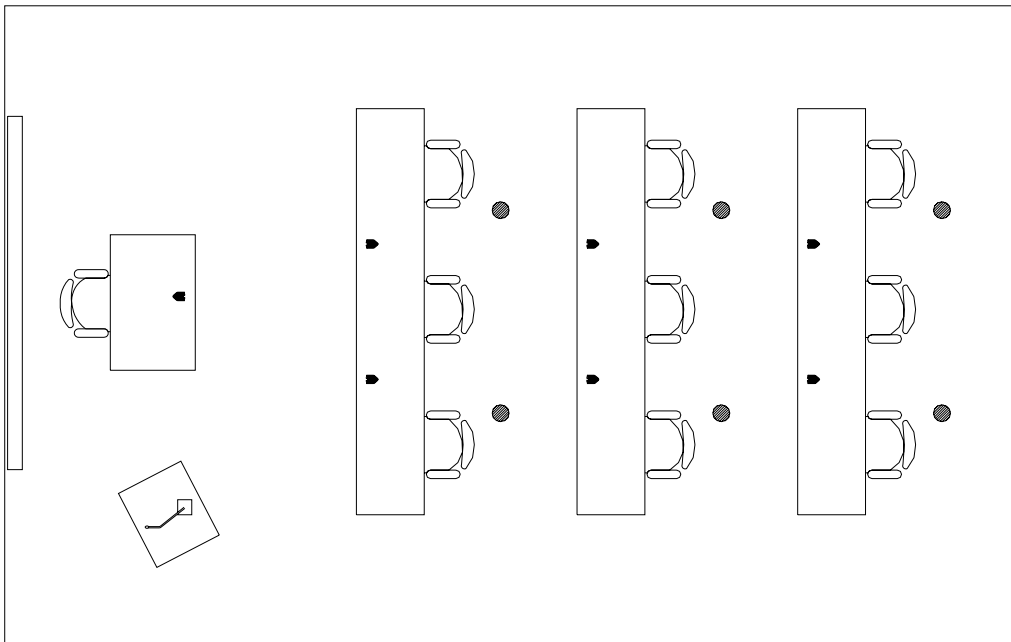
The classroom requires audio and video conferencing system capable of multi-point conferences from four to twelve locations. There is a requirement for data collaboration, white boards, a telephone line allowing remote participants to dial into the system, program audio and video (such as DVD or VCR) for audio and video playback and will often also have a web server to make it easier to build content and create a paperless classroom environment. The students' microphones could either be table mounted, with push to talk buttons, or ceiling mounted to get them away from the student clutter. The camera system for the video conferencing environment may be driven by the microphone audio so that the camera follows the audio. The classroom Conference Composer file is designed so that the camera gating information from the microphones can be used to activate camera presets within the VSX 8000 video codec.

The classroom will typically have between 6 and 64 microphones depending on the size of the room and number of participants, ceiling loudspeakers for each 100-200 sq ft of room, and in the larger rooms, program audio loudspeakers that enable stereo (or even surround sound) reproduction of CD, VCR, and DVD audio.

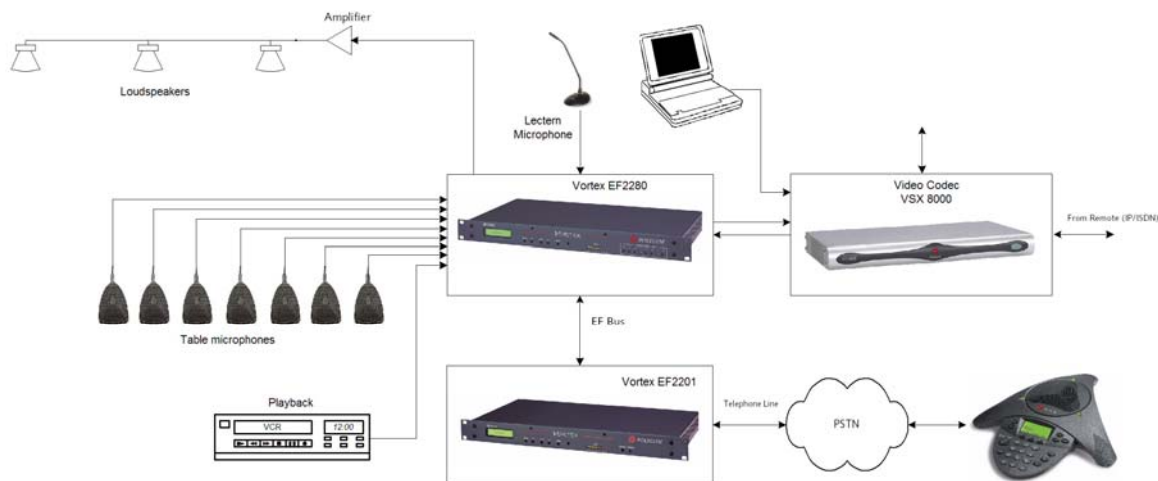
### **6.2 Block Diagram and Description**

A typical class room application, as shown in Figure 13, includes tabletop microphones for the instructor and students, and an optional podium or lectern microphone for the instructor.

There may be one or two loudspeaker zones for the students and several options for program audio and video such as from VCRs, CD players, and DVD player.



**Figure 13. Typical class room layout with instructor and student microphones.**



**Figure 14. System design for a typical class room application.**

## 6.2.1 Equipment List

A typical installation may include equipment such as the following list.

- 1 Polycom Vortex EF2280 (supports 8 microphones)
- 1 Polycom Vortex EF2201 (supports one telephone line)
- 7 table top boundary microphones with push-to-talk buttons connected to Vortex logic inputs and outputs
- 1 lectern microphone for the instructor

- 4 Ceiling loudspeakers (70V or 8 Ohm)
- 1 audio amplifier (70V or 8 Ohm, less than 60 watts per channel required)
- 1 Polycom VSX 8000
- 1 PowerCam for VSX 8000
- 1 Stereo VCR or DVD

## **6.2.2 Conference Composer Design**

The Conference Composer files used to implement this room can be found on the Polycom website at

<http://www.polycom.com/solutions/1,,pw-9572,FF.html>

The Conference composer files for this example are labeled:

ClassRoom.idt (InstantDesigner Template)

ClassRoom.ccp (Conference Composer Project file)

## **7 Lecture Hall**

A lecture hall, set up for distance learning applications, is similar to a distance learning classroom but provides seating for up to several hundred people. It has a central location for presenters with multiple rows of seating in a tiered configuration. There is a requirement for the instructor to be heard well locally (in sound reinforcement), for students to be able to interact with remote participants, and for data collaboration tools.

### **7.1 Conferencing requirements**

The lecture hall requires an audio and video conferencing system capable of multi-point conferences from two to twelve locations. There is a requirement for data collaboration and presentation, white boards, a telephone line allowing remote participants to dial into the system, program audio and video (such as DVD or VCR) for audio and video playback and will often also have a web server to make it easier to build content and create a paperless classroom environment. The students' microphones are normally ceiling mounted as desks tend to be a fold-up type attached to individual chairs. The camera system for the video conferencing environment may be driven by the microphone audio so that the camera follows the audio. The lecture hall Conference Composer file is designed so that the camera gating information from the microphones can be used to activate camera presets within the VSX 8000 video codec.

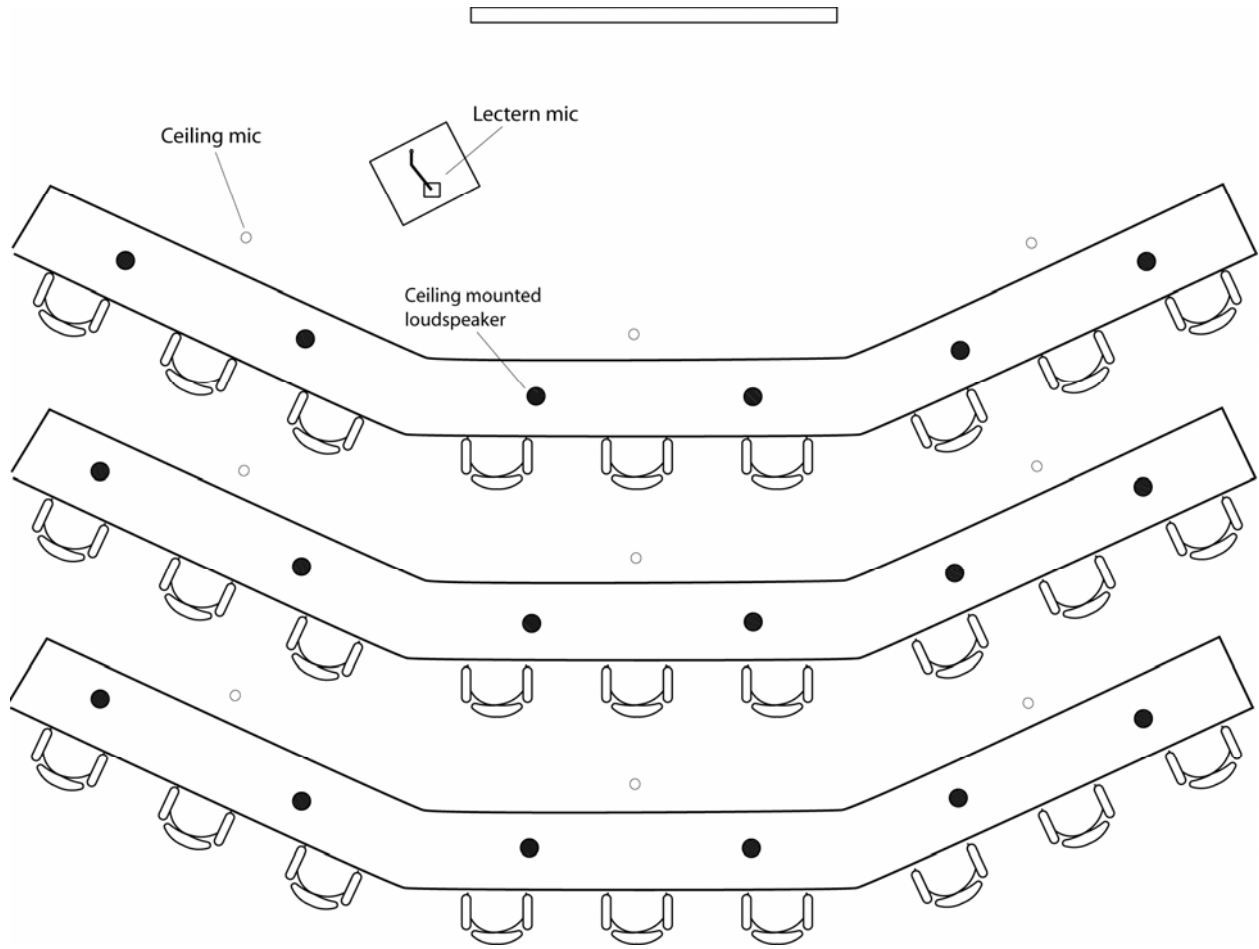
The lecture hall will typically have between 16 and 64 microphones depending on the size of the room and number of participants, ceiling loudspeakers for each 100-200 sq ft of room, and program audio loudspeakers that enable stereo (or even surround sound) reproduction of CD, VCR, and DVD audio.

### **7.2 Block Diagram and Description**

A typical lecture hall application, as shown in Figure 15, includes a wireless microphone for the instructor, with an optional podium or lectern microphone, and ceiling mounted microphones for the students.

There will be multiple loudspeaker zones for the students.

There may be several options for program audio and video such as from VCRs, CD players, and DVD players.



**Figure 15. Typical lecture hall layout with teacher and student microphones.**



LectureHall.idt (InstantDesigner Template)  
LectureHall.ccp (Conference Composer Project file)

## 8 Polycom Design Tips

When using ceiling mounted loudspeakers, use one ceiling mounted loudspeaker for each 100 to 200 sq. ft.

When using tabletop microphones with the Vortex, try to have at least one microphone for every two participants.

Place tabletop microphones within an arm's length of participants. This will ensure good audio pickup as the participants will not be too far from a microphone.

Use ceiling microphones only when there is no other option. Ceiling microphones exhibit the trade-off between flexibility and audio quality and will never sound as good as tabletop microphones but they can be more convenient due to flexible placement options.

Start new Vortex designs with the *InstantDesigner* software. Even if you have to modify the resulting Conference Composer file to meet your final application, this is the best place to start.

### **Polycom Contact Information**

For support on the Vortex product line, call toll-free (USA/Canada) 888-248-4143, then select option 1, and then option 3.

For exclusive Integrator and Consultant focused support (through our PASS program), dial 1.408.474.2048; this number will get you help on video and Vortex products.

For general technical support, dial 1.800.POLYCOM

### **Polycom Installed Voice Business group Contact Information**

Our address is:

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Atlanta, GA 30350  
770-350-4140 Phone  
770-350-4142 Fax

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