

# Microsoft® Windows MultiPoint Server® 2010 Reference Architecture for Dell™ OptiPlex™ Systems

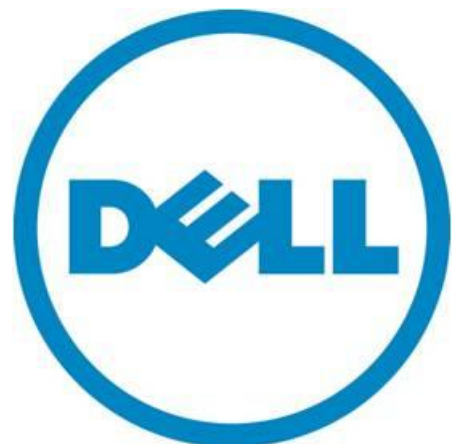
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Dell Configurations for Windows MultiPoint Server 2010 Deployment

Version 1.0

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## Introduction

The Dell™ reference architectures for Microsoft® Windows® MultiPoint Server® 2010 deployment are a family of reference configurations offered by Dell and its partners, designed to aid with planning, ordering, and deploying the MultiPoint Server infrastructure. These configurations are designed to address various numbers of users, types of tasks, and workloads required for the system.

These configurations are targeted at the needs of classrooms and training facilities, although other settings such as libraries, labs, call centers, and home offices may also benefit from these architectures. The solutions defined in this document include the Dell OptiPlex™ 380 and OptiPlex 980 servers, Magic Control Technology MWS 8820 hub, ATI Radeon 3450 graphic card, standard USB hubs and other support peripherals. By following the proven configurations and best practices provided in this document, customers can quickly deploy Windows MultiPoint Server 2010.

## Overview

Microsoft Windows Multipoint Server (WMS) 2010 is a Windows Server 2008 R2-based solution that uses a single system to host multiple, simultaneous and independent user stations. Compared with other virtualization or thin client solutions, WMS helps reduce the total cost of ownership with lower hardware acquisition costs, reduced IT management complexity, and reduced energy consumption. It provides a simplified IT solution for school classrooms and businesses. Dell is currently offering the academic volume license for Windows Multipoint Server 2010.

In a WMS solution, a user station consists of a station hub, monitor, keyboard, and mouse. The station hub can be a standard USB hub which adds more USB ports and extends the distance between the station and the host system. The station hub can also be a multifunction hub, which delivers connectivity to the end stations for their display, keyboard, mouse, and other peripherals such as speakers, headphones, or USB flash drives.

## Hardware Requirements

A Windows MultiPoint Server host system can support up to nine standard stations and one primary station. (The primary station is the first station that becomes active when the WMS is powered on and displays the BIOS and operating system startup screens.)

Note the following considerations when planning the system:

- When accessing multimedia content or Web pages which include full-motion videos, fewer stations can be supported.
- The maximum distance from the host system to a station hub is 10 meters. An intermediate USB hub with external power supply, or a USB repeater cable is needed for each 5-meter extension.
- The maximum levels of USB hubs is 5 (i.e., no more than 5 hubs can be daisy-chained together). Microsoft does not recommend more than 3 levels to ensure reliability.

The following table lists the recommended minimum requirements for processor and memory from Microsoft, based on the number of stations/seats and type of application scenarios.

**Table 1. Processor and Memory Requirements**

Program/Station Scenarios	Productivity	Mixed	Video-Intensive
	(Word processing, spreadsheet, e-mail, and Web browsing)	(Productivity software, plus video playing occasionally on some stations)	(Productivity software, plus video playing frequently on many stations, at the same time)
<b>1 – 4 Stations</b>			
CPU Requirement	x64 dual-core	x64 dual-core	x64 dual-core
RAM Requirement	2 GB	2 GB	2 GB
<b>5 – 6 Stations</b>			
CPU Requirement	x64 dual-core	x64 dual-core	x64 quad-core
RAM Requirement	4 GB	4 GB	6 GB
<b>7 – 10 Stations</b>			
CPU Requirement	x64 quad-core	x64 quad-core	x64 quad-core hyper-threaded
RAM Requirement	6 GB	6 GB	6 GB

## Architecture

Depending on the types of station hubs used, there are two major architecture options when deploying Windows Multipoint Server 2010: connection via video cable and USB hub, and connection via multifunction hub.

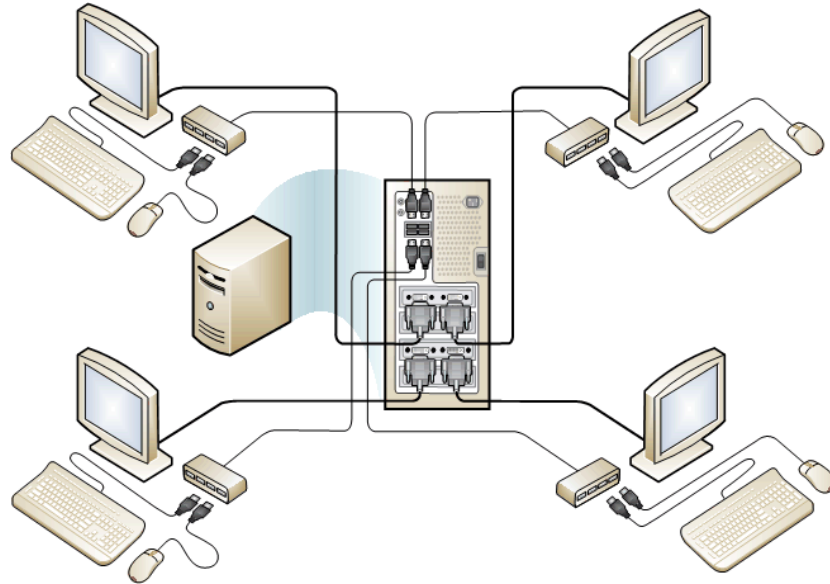
### Connecting via Video Cable and USB Hub

The first option is to set up the end station by connecting its keyboard and mouse via a standard USB hub and connecting its display directly to a graphic port on the host system. This architecture requires the host system to have a multi-port graphic card(s) to provide video function directly to the end stations. Note the following guidelines:

- To set up a station, the keyboard and mouse cannot connect directly to the USB ports of the host system. Instead, they must be connected to a USB hub which serves as a station hub. This setup is also known as “Connect with USB Station Hub”
- The integrated USB hub on the LCD monitors (such as the Dell P190s) can serve as the USB station hub to which the keyboard and mouse can be connected.

Figure 1 illustrates a WMS solution with four stations (including the primary station).

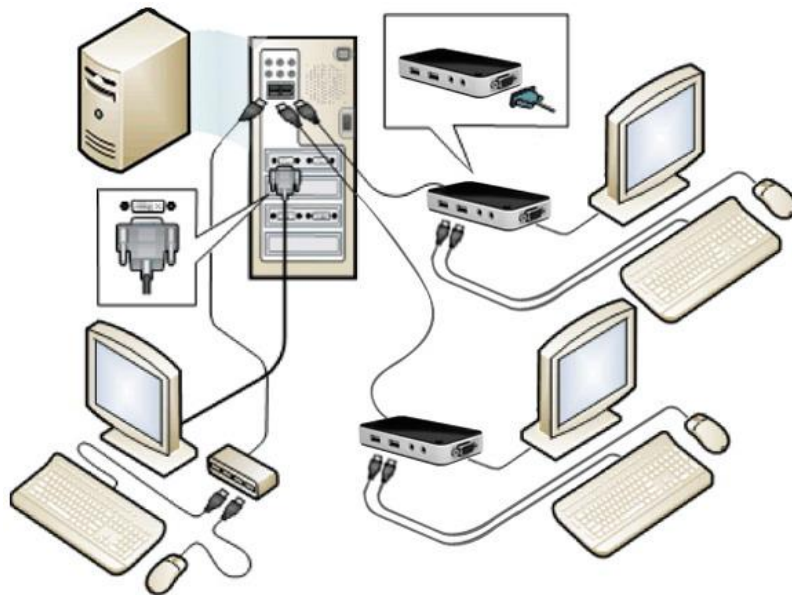
**Figure 1.** Connecting the Station via the USB Station Hub  
(Source: Microsoft)



### Connecting via a Multifunction Station Hub

In the second architecture, each end station is connected with a multifunction hub which provides video, keyboard and mouse connectivity. Some multifunction hubs also provide additional peripheral support such as audio and USB flash drive. When using a multifunction hub, the host system can have a single port integrated graphic controller instead of a multi-port graphics card. Depending on the configuration of the host system and the type of software application(s) running at each standard station, WMS 2010 can support up to 10 standard stations using multifunction hubs.

**Figure 2.** Implementing MWS 2010 with Multifunction Hubs  
(Source: Magic Control Technology)



**NOTE:** To set up the primary station, which is connected to the graphic port of the host system, its keyboard and mouse need to be connected to a standard USB hub or the USB hub integrated into the monitor. The primary station's keyboard and mouse should not be connected directly to the USB ports on the host system.



## Comparison

In order to determine the appropriate architecture choice, it is necessary to compare them by considering typical usage scenarios (software applications running on the stations), the number of seats, and the space layout of the classroom.

**Table 2. Comparison of Architecture Methods**

	Connect via Video Cable and USB Hub	Connect via Multifunction Hub
<b>Advantage</b>	<ul style="list-style-type: none"> <li>• High Performance solution because the discrete graphic card can free up processor resources.</li> <li>• Better video performance for all connected stations</li> <li>• Fewer external-powered USB hubs if using the monitor with integrated USB hub.</li> </ul>	<ul style="list-style-type: none"> <li>• Maximizes the number of standard stations or seats and allows more students to share a single host system.</li> <li>• Ideal if class activities involve Productivity type of work.</li> <li>• Stations can be spread into large areas due to longer distance between the station and the host (limited to 10 meters).</li> <li>• Most multifunction hubs provide audio connectivity.</li> </ul>
<b>Limitation</b>	<ul style="list-style-type: none"> <li>• The number of the station/seats including the primary station is limited to the available graphic ports on a host system.</li> <li>• An additional USB-to-audio adapter is required to deliver audio for video playback at the station.</li> <li>• The distance from the user station to host system is limited by the length of the video cable. (The regular video cable shipped with the monitor is 6 feet long. A longer one can be used to extend the distance.)</li> </ul>	<ul style="list-style-type: none"> <li>• Limited number of stations support video playback depending upon the host system configuration.</li> <li>• Video playback window size is limited and needs to be reduced as the number of seats increases.</li> <li>• Intermediate USB hubs with external power are recommended to connect the multifunction station hubs to the USB port on the host system. (NOTE: It is not recommended to connect the multifunction hubs directly to the host when implementing the 10-seat solution.)</li> </ul>

## WMS Hardware Components

### Host System Options – Dell OptiPlex 380 and OptiPlex 980

With features and form factors that extend well beyond the basics, the Dell OptiPlex 380 is a flexible and cost-efficient solution for WMS 2010.



*Dell OptiPlex 380*

- Form factors: mini tower, desktop, small form factor.
- Chipset: Intel® G41 Express chipset with ICH7.
- Memory: 2 DIMM slots, non-ECC dual-channel 1066 MHz DDR3 SDRAM.
- Graphics: Integrated Intel Graphics Media Accelerator X4500. Also supports add-in x16 PCI Express expansion card.
- Broadcom 57780 Integrated Gigabit Network.
- 8 USB 2.0 ports (2 front and 6 back) and audio ports.

The Dell OptiPlex 980 utilizes the Intel Nehalem architecture and Picketon platform and is the highest performance OptiPlex desktop. The OptiPlex 980 provides enterprise-class performance that fulfills the computational requirement generated by the stations, especially when the maximum numbers of stations are implemented with the multifunction hub architecture. It has three form factors to support the full-range of customer use cases.



*Dell OptiPlex 980*

- Form factors: mini tower, desktop, small form factor.
- Chipset: Intel Q57 Express chipset.
- Memory: 4 DIMM slots, non-ECC dual-channel 1066 MHz DDR3 SDRAM.
- Graphics: Integrated Intel Graphics Media Accelerator X4500. Also supports add-in x16 PCI Express expansion card.
- Network: Integrated Intel 82578DM GbE Ethernet LAN 10/100/1000.
- USB 2.0 ports and audio ports: mini tower has 10 USB ports (4 front and 6 back); desktop and small form factor has 8 (2 front and 6 back).
- RAID: RAID 0/1 support on select configurations.

## Multifunction Hub

There are several independent hardware vendors providing compatible multifunction hubs. Magic Control Technologies' MWS 8820 is specifically designed for Windows MultiPoint Server 2010. It can be installed by simple plug and play after installing the required driver on the host system. Also, no action of association is required when connecting a station to the host system.



*MCT MWS 8820*

- Provides VGA Port support up to 1600 x 1200
- Two USB 2.0 ports for Keyboard and Mouse
- Speaker out & Microphone in ports
- Up to 10 workstations per server
- USB Bus power

**NOTE:** Given that the MWS 8820 hub is USB bus-powered, you should use an intermediate USB hub with external power supply instead of connecting it directly to the host system.

**NOTE:** Do not mix different brands of multifunction hubs on the same host of WMS 2010, to avoid potential driver conflicts.

## Dual-Port Graphic Card

With platform-independent intelligent power management, the ATI Radeon HD 3450 delivers the power to blaze through the most intense applications, and supports expansion of visual workspace with multi-monitor support for advanced multi-tasking. With a blend of ultra-threaded core architecture and ATI's Avivo video and display technology, it delivers vibrant colors and ultra-sharp images as well as smooth video playback. It supports full DirectX 10.1 and DirectX 9. The ATI Radeon HD 3450 card is available with either Dual DVI or Dual VGA ports.

Two ATI Radeon HD 3450 cards can be installed in a Dell OptiPlex 980 system. Having two 3450 cards in the host system can provide the video connectivity for four independent stations.

**NOTE:** The Dell OptiPlex 380 also supports the ATI Radeon HD 3450. However, only one Radeon HD 3450 card can be used on an OptiPlex 380 system.

## Other Peripherals

In addition to the key components illustrated above for deploying a WMS 2010 solution, other peripherals such as the following are also required.

### *USB Hub*

The USB hub plays two roles in the WMS implementation. One is to serve as the **station hub** between the station and the host system. It provides the USB connectivity to the keyboard and mouse for the end station. The station's monitor is directly connected to the host system. When using a monitor with an integrated USB hub, the keyboard and mouse can be connected to the USB port on the monitor and the external USB hub is no longer needed.

**NOTE:** Some USB hubs have a hidden integrated USB hub which generates two different USB hub layers. Some ports on that physical hub are at one layer and others are at a different one. When serving as a station hub, the keyboard and mouse must be connected to ports on the same layer; otherwise, the

mouse or keyboard may not be mapped correctly for that station. (In general, the USB ports on the same side of a hub are on the same USB hub layer.)

Another role for the USB hub is to serve as the **intermediate hub** between the station hub and the host system. The intermediate hub can be a standard USB hub or a multifunction hub. The intermediate hub can increase the number of USB ports. It can also extend the distance between the station and the host, extending the implementation of WMS into a larger area. (Note that the distance between the host and station is limited to 10 meters according to Microsoft.) When serving as an intermediate hub, the USB hub requires an external power supply.

### ***Monitors***

Depending upon the capabilities of the graphic card or the multifunction hub, both digital (DVI) and analog (VGA) monitors can be used as a display for the station. The selection of screen resolution depends on the number of stations and the types of applications on the stations. As mentioned in the previous section, it is cost-efficient to use a monitor with an integrated USB hub. This feature can also free up table space and cut down on configuration complexity by reducing the number of external USB hubs.

### ***Keyboard and Mouse***

Most multifunction hubs provide the USB connectivity to the keyboard and mouse at the station. Therefore, keyboards and mice with USB connectors are needed. One concern is that some types of USB keyboards have an USB extension port for the mouse. For these types of keyboards, be sure to connect the mouse to that extension port instead of the port on the station hub. Because it generates an additional layer of USB hub, this type of keyboard is not recommended (especially when an intermediate USB hub is being used) given that the maximum levels of USB hubs is limited to 5.

### ***USB-to-Audio Adapter***

When using the multi-port graphic card to deploy the WMS, a USB-to-audio adapter is needed if the video playback is expected at the station. Connect the USB-to-audio adapter to the USB station hub to provide the audio connectivity to the station user. Dell offers the following USB audio adapters at this time:

- StarTech.com Virtual 7.1 USB stereo Audio Adapter External Sound Card (Dell Part # A3000641)
- StarTech.com USB to Stereo Audio Adapter Converter (Dell Part # A1261025)

### ***Monitor, Keyboard and Mouse Options From Dell***

A variety of Dell-branded monitors, USB keyboards, and USB mice have successfully been tested with Windows MultiPoint Server 2010. Some examples include:

- Dell Professional P190S 19-inch Flat Panel Monitor with High-Adjust-Station (Like other types of Dell LCD monitors, it has an integrated USB hub with 4 USB ports.)
- Dell MS111 USB Optical Mouse
- Dell QuietKey Keyboard

## Host System Specifications

### *Dell OptiPlex 380*

- Minitower with Standard power supply
- Intel Core™ 2 Duo E7500 with VT (2.93GHz, 3M, 1066MHz FSB)
- 4GB DDR3 Non-ECC SDRAM, 1333MHz, (2 DIMMs)
- Integrated Video, Intel® GMA 4500, VGA
- 320GB 7,200 RPM 3.5" SATA, 3.0Gb/s Hard Drive with NCQ and 16MB Cache

### *Dell OptiPlex 980*

- Minitower with Standard Power Supply
  - Intel Core i7 Quad Core Processor 860 with VT (2.80GHz, 8M)
  - 8GB DDR3 Non-ECC SDRAM, 1333MHz, (4 DIMMs)
  - 256MB ATI RADEON HD 3450 (2 VGA / 1 TV-out), Full Height
  - 320GB 7,200 RPM 3.5" SATA, 3.0Gb/s Hard Drive with NCQ and 16MB Cache
  - One ATI Radeon HD 3450 card when using multifunction hubs set up for the 10-seat solution; (NOTE: The quad-core processor is not compatible with the integrated graphics.)
- or*
- two ATI Radeon HD 3450 cards when using standard USB hubs instead of multifunction hubs. The two 3450 cards provide capability for up to 4 stations.

## Configurations

To meet the needs of different sizes and types of classrooms and different classroom activities, four different configurations have been identified, given the performance capacity of the OptiPlex 980 and 380 and other key components such as multifunction hubs or multiport graphic cards. Typically, there are two major types of tasks or applications at the standard stations, defined as following:

- **Productivity** software applications. This includes word processing, spreadsheet, e-mail, and Web browsing, etc.
- **Video** playback simultaneously with the manufacturer-recommended player window size, especially when the station is connected with a multifunction hub.

Due to the limitation of USB bandwidth, it is recommended to scale down the landscape or window size of the video player in order to maintain smooth playback performance. This is especially important when running video playback simultaneously across multiple stations. The following scale down settings are recommended when using Magic Control Technologies' MWS 8820 as a multifunction hub at the station:

- 2 stations: full screen of display
- 4 stations: 1/3 landscape of display
- 6 stations: 1/4 landscape of display
- 8-10 stations: 1/8 landscape of display

**Table 3. Sample Configurations**

	10-Seat Performance	10-Seat Economy	4-Seat Economy	4-Seat Power Graphics*
<b>Stations</b>	10 standard stations including 1 primary station	10 standard stations including 1 primary station	4 standard stations plus 1 primary station	4 stations including the primary station
<b>Host System</b>	OptiPlex 980	OptiPlex 380	OptiPlex 380	OptiPlex 980
<b>Station Devices</b>	<ul style="list-style-type: none"> <li>• 1 ATI Radeon HD 3450 card</li> <li>• 8 Magic Control Technologies MWS 8820 hubs</li> <li>• 4 USB hubs (2 for the intermediate hub, 2 for the station hub)</li> <li>• 10 sets of monitors, keyboards and mice</li> <li>• 10 Headsets</li> <li>• 2 USB-to-Audio adaptors</li> </ul>	<ul style="list-style-type: none"> <li>• 9 Magic Control Technologies MWS 8820 hubs</li> <li>• 3 USB hubs (2 for intermediate hub, 1 for primary station)</li> <li>• 10 sets of monitors, keyboards and mice</li> <li>• 10 Headsets</li> <li>• 1 USB-to-Audio adaptor</li> </ul>	<ul style="list-style-type: none"> <li>• 1 OptiPlex 380</li> <li>• 4 Magic Control Technologies MWS 8820 hubs</li> <li>• 2 USB hubs (1 for intermediate hub, 1 for primary station)</li> <li>• 5 sets of monitors, keyboards and mice</li> <li>• 5 Headsets</li> </ul>	<ul style="list-style-type: none"> <li>• 2 ATI Radeon HD 3450 cards</li> <li>• 4 USB hubs (not needed if using monitors with integrated USB hubs)</li> <li>• 4 sets of monitors, keyboards and mice</li> <li>• 4 headsets</li> <li>• 4 USB-to-Audio adaptors</li> </ul>
<b>Support Tasks</b>	Both Productivity and video on 10 seats	Productivity on 10 seats but video limited to 3-4 seats	Productivity and video on all 4 seats	Intensive video tasks with large size of player window
<b>Notes</b>	Video player size must follow the recommendation in this section to avoid or video playback disruption.	Video playback is not recommended.	Intermediate hub is needed only when the unattended disconnection of stations occurs.	Primary station can be either logged off or disconnected in order to provide 4 standard stations.
* An alternative way to set up this type of configuration is to use a quad-port ATI FirePro 2450 card in the OptiPlex 380. However, because the OptiPlex 380 is not currently shipping with any configuration with the 2450 card, you will have to purchase and install the 2450 card separately.				

## Licensing

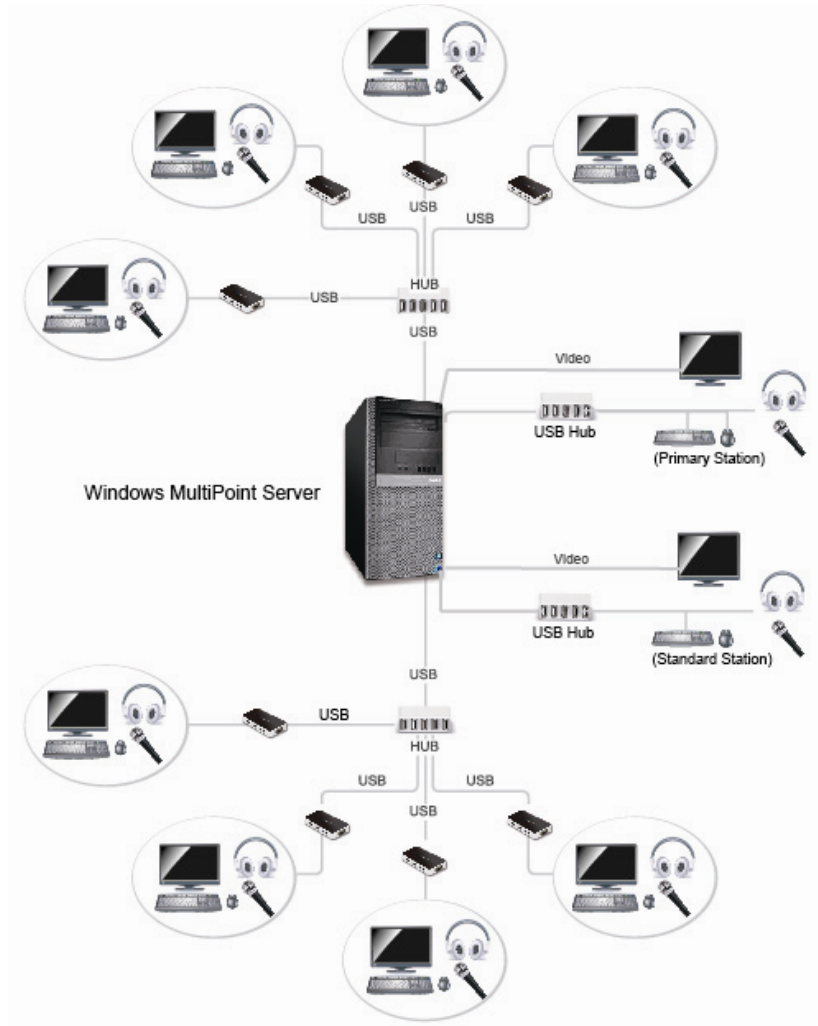
There are two ways to acquire Windows MultiPoint Server 2010: the Microsoft Academic Volume Licensing program, and preinstalled from OEMs (Original Equipment Manufacturers). Dell currently offers an Academic Volume License for WMS 2010.

Compared with the OEM version of WMS 2010, the Academic Volume License allows the software and hardware to be acquired separately. This separation provides opportunities to build the best value solution with the available configuration options based on the exact needs of the customers' usage scenarios. The academic license version of WMS also supports domain join, while the OEM version does not. With domain join, administrators can easily integrate the WMS into their existing active directory

domain, eliminating the initial setup task for the users on the WMS host. In addition, while the OEM version only allows access by up to 10 simultaneous users, the academic version of WMS allows more than 10 users to simultaneously access one academic license of Windows MultiPoint Server 2010 Academic as long as every accessing device or user (including the host computer if used as a station) has a Windows MultiPoint Server CAL and a Windows Server CAL. Detailed license information is available on the Microsoft Windows MultiPoint Server 2010 site at:

<http://www.microsoft.com/windows/multipoint/buy.aspx>

**Figure 3.** A 10-Seat Implementation of WMS Using Multifunction Hubs



**NOTES:**

- A Dell OptiPlex 980 system is used as the host system in this setup. It has an ATI 3450 graphic card with two graphic ports.
- Two USB hubs are used as the intermediate hubs in this setup. For every 4-5 stations, they share the bandwidth of an intermediate USB hub. Be sure to scale the video player screen size according to the number of stations. To achieve better performance, Microsoft recommends adding another intermediate USB hub and moving some of the multifunction hubs to it.

- Two other USB hubs are used as the station hub for the two stations which are connected to the graphic ports on the system. A USB-to-audio adaptor is needed for audio services on these two stations.

## Deployment

Follow these guidelines when setting up your particular WMS implementation.

### Setting up the Host System

Before connecting the standard stations to the host system, it is important to complete the Windows MultiPoint Server operating system installation on the host system:

1. Set up the primary station by connecting a USB hub and display directly to the host system, and then connecting the keyboard and mouse to the USB hub.
2. Install Windows MultiPoint Server 2010 on the host system with the WMS OS media.
3. After WMS 2010 installation is complete, enter the maintenance mode and install the device drivers for devices such as the video adapter, network adapter, and sound card.

**NOTE:** There is no unique driver requirement for MultiPoint Server 2010. Use the drivers for Windows 7 64-bit or Windows Server 2008 R2 to implement WMS 2010. The latest driver releases for all devices shipped with OptiPlex systems can be downloaded at [support.dell.com](http://support.dell.com).

Once the host system installation is complete, you are ready to physically set up standard stations.

### Setting up Stations Using Multifunction Hubs

In the example shown in Figure 3, eight of the ten standard stations were deployed using multifunction hubs:

1. Before connecting the multifunction hubs to the host system, boot the host system into maintenance mode and follow the manufacturer's instructions to install the multifunction hub software.
2. Connect the monitor, keyboard and mouse to the multifunction hub. Ensure that the monitor is turned on, then connect the multifunction hub to the host system directly or via an intermediate USB hub. After the driver for the multifunction hub is automatically installed, the login prompt appears on the station. Repeat this step to set up the remaining stations.

To set up some manufacturers' multifunction hubs, manual association is required by pressing the required key prompted on the screen. The correct key entry triggers the manual association for the keyboard, mouse and display for that station. When manual association is required, set up the stations one at a time.

**NOTE:** When using the MCT MWS 8820 hub, association occurs automatically during the station setup and no manual mapping steps are needed.



## Setting up Stations With Video Cables and a USB Station Hub

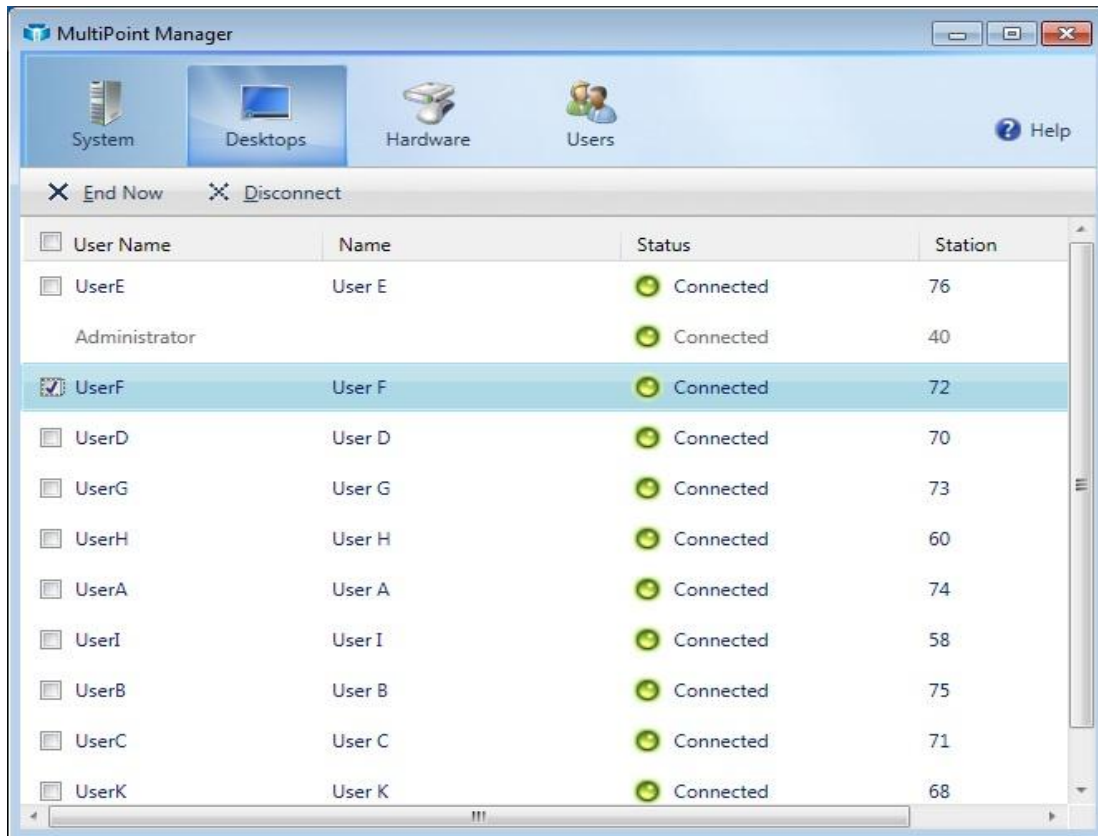
As illustrated in Figure 1, the displays of standard stations can be connected directly to one of the graphic ports on the host system.

1. Ensure that the proper 64-bit driver is installed for the graphics card.
2. Turn off the host system and unplug the power cord.
3. Connect a keyboard and mouse to a USB hub, and connect the USB hub to a USB port of the host system.
4. Connect a monitor to one of the video ports on the host system
5. Repeat Steps 3 and 4 for the remaining stations.
6. Connect the power for the host system and turn it on.
7. Follow the instructions on each display to manually associate the devices with the station.

### NOTES:

- When implementing this configuration on an OptiPlex 980 with dual ATI Radeon 3450 cards, the primary station should be connected to the 1<sup>st</sup> graphic port of the ATI 3450 card located in Slot 4 (the lower one). Before the proper driver is installed, there will be no video on any port of the card located in Slot 1 (the upper one). Once the proper driver for Windows 7 64 bit is installed, video should be available on all four graphic ports.
- For each station, be sure to have either the USB speakers connected or a headset connected via a USB-to-Audio adapter. Without an audio device connected and successfully associated with a station in the WMS, that station may not have smooth video playback.

**Figure 4. MultiPoint Manager**



## Management

Windows MultiPoint Server 2010 provides administrative users with the MultiPoint Manager to monitor and manage the stations, hardware status, user sessions, and user accounts. There are four panels in MultiPoint Manager: System, Desktop, Hardware, and Users.

- At the System panel, administrators can view license status and switch into the maintenance mode. (NOTE: Switching into a different mode will cause the host system to reboot.)
- At the Desktop panel, an administrator can view the current users and can manage them by either ending their session or disconnecting them from the WMS station. Figure 4 shows the interface of the Desktop panel.
- At the Hardware panel, administrators can view all the connected hardware devices for each station. If a required device such as keyboard, mouse and display has some problem at that station, a status column will report the issue.
- At the Users panel, administrators can manage the user accounts and add a new user.

Details on how to conduct other management tasks such as installing application software, installing updates, and troubleshooting are available in the help file and on the MultiPoint Server site on Microsoft TechNet.

## Reference

- Microsoft MultiPoint Server 2010:  
<http://www.microsoft.com/windows/multipoint/default.aspx>
- Microsoft MultiPoint Server 2010 on TechNet: <http://technet.microsoft.com/en-us/library/ff683633.aspx>
- Magic Control Technology MWS 8820 Product Site: <http://www.mct.com.tw/product01.html#a>
- AMD ATI Radeon HD 3400 Series:  
<http://www.amd.com/US/PRODUCTS/DESKTOP/GRAPHICS/ATI-RADEON-HD-3000/HD-3400/Pages/ati-radeon-hd-3400-overview.aspx>