# Technical Brief

## NVIDIA nView Technology
A Revolution in Multi-display
Functionality and Performance
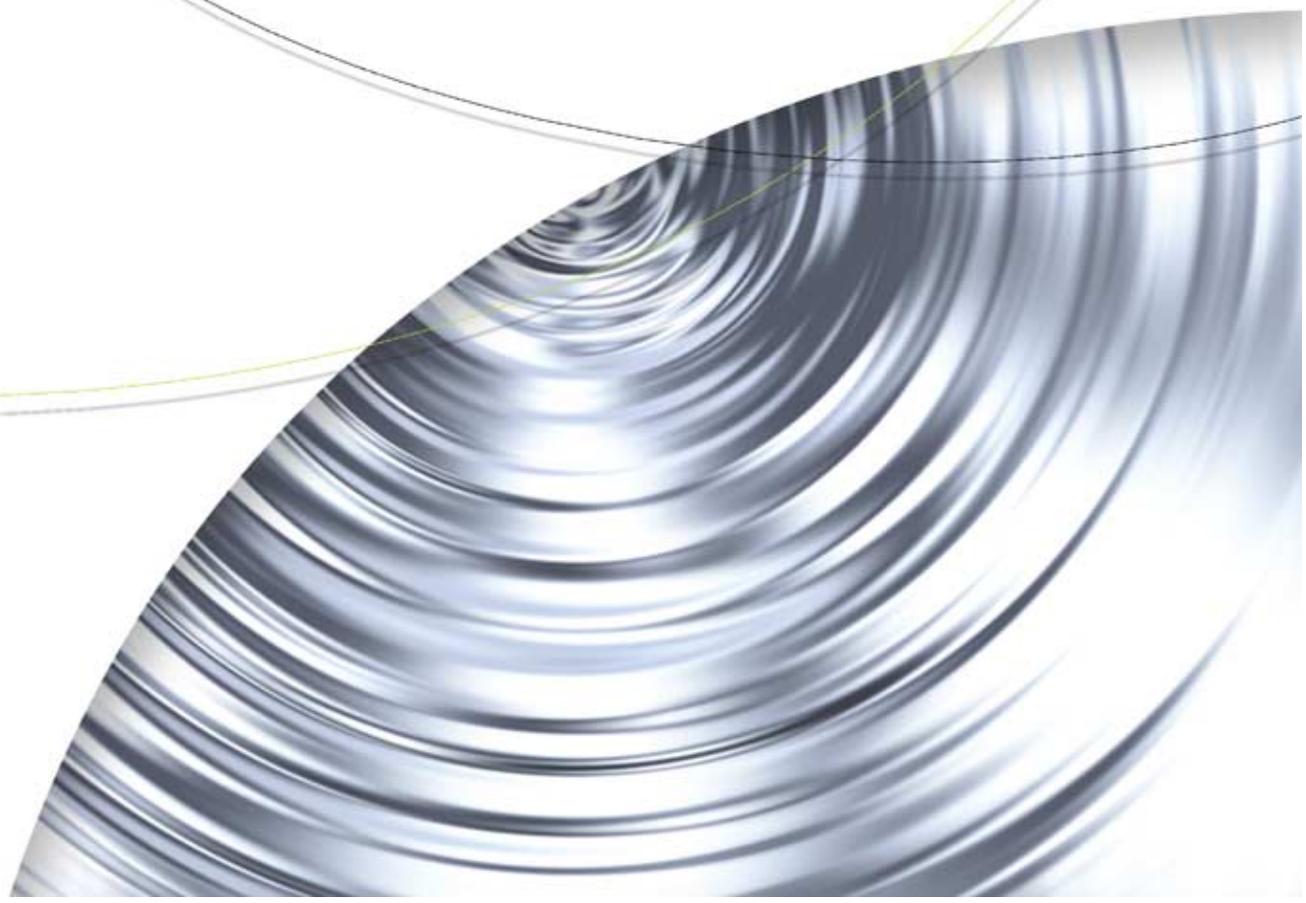
# nView
# Multi-display Technology

Desktop PCs and workstations with multiple displays are rapidly becoming commonplace in all markets, especially as users recognize the immediate benefits of having the larger workspace that multiple displays provide. When they were first introduced, multiple displays were primarily used in specialized applications such as financial institutions and airport readout displays. However, the capabilities that multi-displays provide can benefit anyone—multimedia users, designers, marketing executives, game developers, and other business professionals who want higher levels of productivity and efficiency.

Another benefit is the ability to display more screen area at a lower cost. Like semiconductor processors, the cost of displays goes up exponentially with size. Giving end users the option to use multiple smaller displays to achieve greater screen area is more cost effective than using one large display.

With the introduction of NVIDIA®'s nView™ Multi-display technology, NVIDIA redefines the industry standard by integrating key new features in both software *and* hardware. nView leverages NVIDIA's industry-leading Graphics Processing Units (GPUs) and Detonator™ XP software architecture to provide end users with easy multi-display setup, robust multi-desktop management, and full window and application management.



**Figure 1.**     Common Multi-display Environments

# Hardware Features

In developing its newest GPUs and professional graphics families, including the NVIDIA GeForce4™ and Quadro4™ GPUs, NVIDIA recognized the importance of integrating key features that offer the most robust support for multi-display configurations. Among them are:

❑ Dual 350MHz RAMDACs, which drive dual displays without the need for additional external components
❑ Dual Cathode Ray Tube (CRT) pipes, which drive independent graphics and video data
❑ An integrated Video Processing Engine (VPE), which delivers the highest quality DVD and video output
❑ Dual LVDS transmitters, which drive high-resolution notebook LCD panels
❑ TMDS transmitters, which drive flat-panel displays

A full list of nView's hardware features is listed in the Appendix.

# Software Features

The nView software was designed to deliver many new features, each of which simplify setup and support, allow for full customization and maximize user productivity. Key nView components include:

❑ Setup Wizard
❑ Multi-display modes
❑ Desktop management
❑ Window and application management
❑ Hot keys

In addition, nView contains advanced features that redefine the standard for multi-display solutions, including:

❑ Application extensions for Microsoft® Internet Explorer® and Microsoft Office®
❑ Transparency effects
❑ Setup profiles
❑ Advanced zoom features for detailed editing

# Setup Wizard

One of the main drawbacks of current multi-display software is setting up and configuring multiple displays.  If an end user cannot set up and maintain their system quickly and easily, they will not continue to use it.

nView solves this problem by providing a Setup Wizard that assists end users in configuring their multi-display solutions quickly and correctly.  The Wizard helps end users set up the most commonly used nView features through intuitive menus.  Each step of the way, end users are prompted with text, diagrams and pictures to configure nView for their individual needs (see Figure 2).



**Figure 2.**    nView Setup Wizard

# Multi-display Modes

Along with providing end users the easiest setup, nView offers a variety of multi-display modes.  nView supports native Microsoft Windows® XP and Windows 2000 Dualview mode, with up to nine displays available from the standard Microsoft control panel.  Each display provides full acceleration for all DirectX® and OpenGL® applications. Big desktop - or Span mode - is also available for end users who need it.  For end users who want to display the same information simultaneously on multiple displays, Clone mode is also available.  Without a doubt, nView offers end users the most flexibility for any multi-display configuration.

# Window and Application Management

Once end users select their multi-display mode, nView allows them full control over repositioning dialog boxes and application windows, which lets them create the ideal setup for their workspace.

nView provides the most advanced window repositioning algorithm in the industry, guaranteeing accurate placement of windows and dialog boxes.  End users can relocate dialog boxes to a specific display, to the mouse cursor, or to the application's display (see Figure 3).


Multi- Screen Problem:  Dialog box split between displays


nView Solution:  Dialog box repositioned on display two


nView Solution:  Dialog box repositioned to application's display


nView Solution:  Dialog box repositioned to the mouse cursor
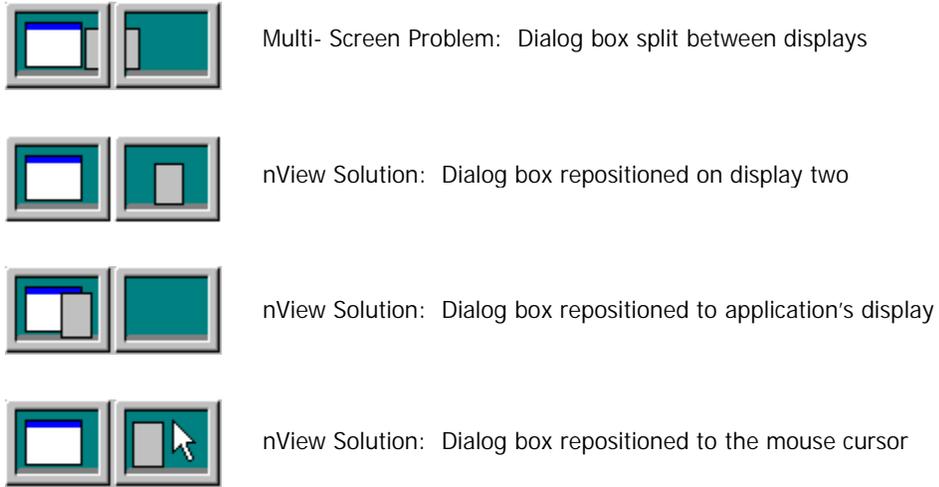
**Figure 3.**   **nView Solutions to Multi-display Problems**

Application and window management allows end users to control where their applications appear on their multiple displays and desktops.  nView lets end users control each window through system menu extensions to enable quick access to transparency options, multi-desktop integration, individual application settings, window move functions, and application specific extensions (see Figure 4).
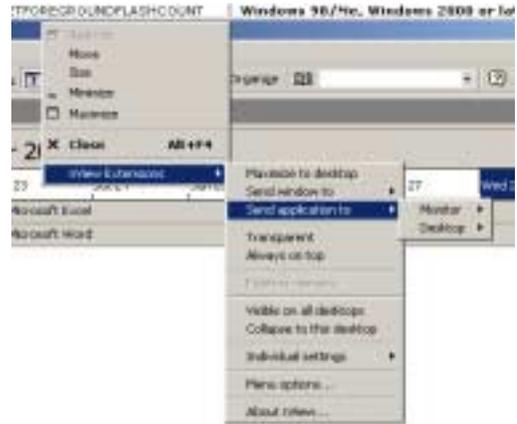


**Figure 4.**   **Application Management System Menu Extensions**

# Desktop Management

While application and windows management helps end users visually organize a single desktop, the workspace can get cluttered with too many windows open at once. nView Desktop Manager solves this problem by providing the most robust desktop management software available.

nView supports up to 32 individually-named desktops that are integrated with the window and application management functionality of nView. Each desktop is fully customizable to allow end users to change the desktop name, select a custom desktop background, and control application-availability on each desktop. nView Desktop Manager integrates directly into *Windows Explorer*, which lets users visualize and customize their desktops in a familiar user interface. In addition, switching desktops is a snap using the nView QuickTweak taskbar icon or hot keys to quickly switch between desktops

nView Desktop Manager is the only multi-display software that stores desktop settings on a per-user basis—rather than a global basis—under all versions of Windows. This can be a great benefit in the corporate market because many end users can share the same machine and still maintain their own unique settings.

As an example, a financial trader could use a Quadro4 NVS graphics board and nView to create three different desktops called: Finance, Internet and Word. Using Desktop Manager, the trader could allow Microsoft Excel® and Bloomberg® to launch only on his Finance desktop; Internet Explorer to only launch on the Internet desktop, and Microsoft® Word® to launch only on the Word Desktop. The trader could then customize Microsoft Outlook® to launch on all desktops so he would always have access to his email. In addition, the trader could force the dialog boxes for Bloomberg to always appear at the mouse cursor so he would never miss a trade, no matter what desktop or monitor he was currently working in. By customizing his desktop to his needs, this trader is now maximizing his productivity by streamlining the amount of information he sees at once.

Another example of desktop management is the business professional that creates three different desktops called *Marketing Documents*, *Internet*, and *Presentations*. Using Desktop Manager, the user can allow Microsoft Excel® and Word® to launch only on his *Marketing Documents* desktop; Internet Explorer and Windows Messenger to launch only on the *Internet* desktop; and Microsoft PowerPoint® to launch only on the *Presentations* desktop.

# Advanced Window and Menu Effects

nView also offers advanced transparency effects that enable quicker access to hidden windows on cluttered desktops (see Figure 5).  End users have full control over the level of transparency for their windows and can enable or disable this feature through system menu extensions.
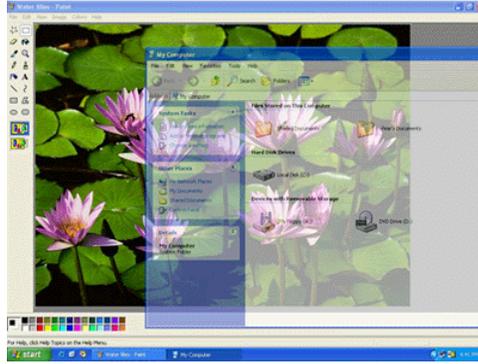


**Figure 5.**   Transparent Window Effects

# Setup Profiles for Users

End users can customize all nView features for their individual setup.  However, large organizations that deploy thousands of systems often use disk images in order to make system setup and technical support easier for the information technologies (IT) department.

nView's support for desktop profiles offers easy deployment required by IT departments.  It lets them create unique multi-display individual profiles for every department in their organization. (see Figure 6)
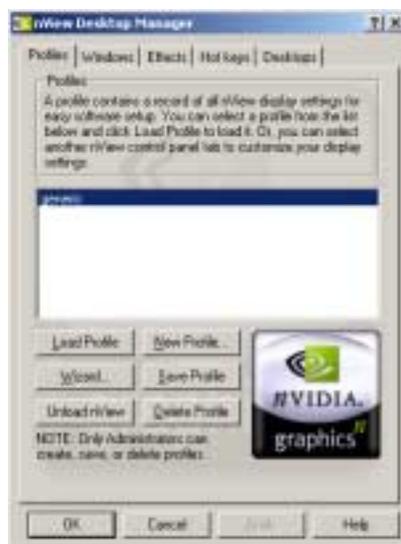


**Figure 6.**   Profiles Control

By storing the entire nView state—including multi-display modes—in a single profile, IT departments can easily install thousands of nView-enabled systems with a few standard configurations and no additional end-user setup. To standardize system configurations and eliminate support calls, IT departments can also hide the nView control panel options.

In addition, NVIDIA's patented Unified Driver Architecture (UDA) ensures that a single driver binary works across all NVIDIA products. Thus, all NVIDIA nView - enabled products use the same driver, saving IT departments valuable time and resources. Entire companies can be managed efficiently by combining NVIDIA's UDA with nView 's ease of installation and manageability.

## Application-Specific Extensions

In addition to extending application usability through application management, multiple desktops, and transparency effects, nView detects specific applications installed on a system and adds more functionality. For instance, nView enables advanced Web browsing with Internet Explorer. This feature is extremely useful when a search engine is used to look for a particular Web page. After entering the search parameters, end users can open the hyperlinks on the second display, while maintaining the original "master" window on the first display. In future releases, NVIDIA will continue to add more application-specific extensions to nView to optimize application functionality for multi-display environments.

## Zoom

The zoom feature is a valuable tool for users who want to enlarge portions of the screen so they can easily view information. As an example, zooming lets a user enlarge a digital photo she is editing in Adobe® Photoshop® on one display, while still viewing the picture at its original size on the other display.

The advanced zoom capabilities of nView allow users to enlarge portions of the screen quickly and with more flexibility than other multi-display software. End users can select either magnifying glass or center on mouse cursor zoom mode, depending on their needs. By providing full control over the zoom window through hot keys and zoom level via the mouse wheel, end users can seamlessly move in and out of zoom mode while they work.

## Hot keys

nView contains a straightforward configuration utility that lets end users bind every nView action to a keyboard hot key. Setting up hot keys is as easy as selecting the nView action, pressing the keystrokes, and saving the new hot key.

Whether it is managing windows, changing desktops, or using zoom features, nView's hot keys let users maximize productivity by controlling common actions with single keystrokes.

# Application Benefits

NVIDIA worked closely with key development partners and end users to ensure nView delivered the features required in as many application fields as possible. Application areas targeted by nView technology include corporate PC and workstation end users in the following areas:

Professional Workstation applications (Quadro4-certified)

- ❑ Finance
- ❑ Non-Linear Video Editing (NLE)
- ❑ Digital Content Creation (DCC)
- ❑ Computer-Aided-Design (CAD)

Corporate PC/Consumer applications (GeForce4)

- ❑ Business/Office use
- ❑ Personal/Home use

The built-in, superior application-specific technology offered by nView guarantees a highly productive and enjoyable user experience. For example:

Professional Workstation applications (Quadro4-certified)

- ❑ A *financial professional* will enjoy the transparent windows and desktop management features for easily tracking diverse exchanges, industries, or markets, as well as the application management features.
- ❑ A *DCC/NLE professional* can create higher-quality content using the development tools, libraries, and palettes and video control panels in one display while simultaneously viewing the results on a second display using enhanced zoom capabilities.
- ❑ A *CAD* professional can utilize multiple displays to simultaneously view different applications such as a design application on one display, while accessing a parts database on a second display.  The second display also provides additional screen real estate for MCAD control panels and other design tools.

Corporate PC/Consumer applications (GeForce4)

- ❑ A *businesswoman* can use custom desktops and profiles to configure her notebook for the office and on the road.  In the office, she can use her nView-enabled notebook with an external flat panel display for daily activities. On the road, she can use her notebook with a secondary projector for customer presentations.  nView lets her quickly change between the two settings using the custom profiles she created.
- ❑ A *college student* can use a Windows XP desktop PC to download music and videos from the Internet.  At the same time, he can hook up a TV as a secondary display driven by his PC and watch DVD movies.  nView 's full Windows XP support for multiple displays lets him maximize his investment while still having fun.

# Conclusion

NVIDIA's nView technology represents the pinnacle of multi-display functionality and performance. It offers revolutionary hardware and software innovations, including a tight integration of key display components, and support for customizable work environments and end-user profiles. With multi-display solutions rapidly becoming the standard, end users depend on the increased productivity and efficiency that only a multi-display setup can provide.

With nView, NVIDIA provides the most powerful, reliable, and stable multi-display solution. nView defines the standard for multi-display technology solutions.



**Figure 7.** Quadro4 400 NVS Quad-Display Solution

# Appendix A
# Hardware Features

Corporate PC/Consumer applications (GeForce4):

| Feature | Benefit | GeForce4 MX/Go | GeForce4 Ti |
|---|---|---|---|
| Dual, 10-bit, 350MHz RAMDACs | The RAMDACs directly drive dual displays without additional external components. | Y | Y |
| Dual CRTC pipes | The dual CRTC pipes drive independent graphics/video data, a key-enabling feature of nView. | Y | Y |
| Integrated high-definition Video Processing Engine | The Video Processing Engine (VPE) delivers the highest quality DVD, video, and display output available in the market today. | Y | N |
| Dual LVDS transmitters | The LVDS transmitters directly drive high-resolution LCD panels. | Y | N |
| TMDS transmitters | The TMDS transmitters directly drive FPD displays. | Y | Y |
| Completely integrated TV-Out functionality | This feature includes encoder, scalers, filters, and DACs. | Y | Y |
| Digital Vibrance Control technology | This technology enables users to independently tune the video settings for each of the display devices, resulting in richer, brighter, and clearer images. | Y | Y |

Professional Workstation applications (Quadro4-certified):

| | | Quadro4 NVS Family | | Quadro4 XGL Family | | | | |
|---|---|---|---|---|---|---|---|---|
| Feature | Benefit | Quadro4 200 NVS | Quadro4 400 NVS | Quadro4 500 XGL | Quadro4 550 XGL | Quadro4 700 XGL | Quadro4 750 XGL | Quadro4 900 XGL |
| Dual, 10-bit, 350MHz RAMDACs | The RAMDACs directly drive dual and/or quad displays without additional external components. | Y | Y | Y | Y | Y | Y | Y |
| Quad, 10-bit 350MHz RAMDACs | | N | Y | N | N | N | N | N |
| Dual CRTC pipes | The dual CRTC pipes drive independent graphics/video data, a key-enabling feature of nView. | Y | Y | Y | Y | Y | Y | Y |
| Dual single link TMDS transmitters | The TMDS transmitters directly drive FPD displays. | Y | Y | Y | Y | N | N | Y |
| Quad single link TMDS transmitters | | N | Y | N | N | N | N | N |
| Certified & tested with professional applications (financial, NLE, CAD, DCC) | Guarantees performance and compatibility with professional financial & NLE video applications | Y | Y | Y | Y | Y | Y | Y |
| | Guarantees performance and compatibility with professional CAD and DCC applications | N/A | N/A | Y | Y | Y | Y | Y |