User Guide

Introducing Hybrid SLI Technology

Document Change History

Version	Date	Responsible	Description of Change
_v01	April 15, 2008	TS	Initial customer release

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Introducing
Hybrid SLI Technology

Built upon NVIDIA SLI® technology, Hybrid SLI® enables NVIDIA® discrete GPUs and NVIDIA motherboard GPUs to work together to deliver multi-GPU benefits. Hybrid SLI provides significant performance scaling through GeForce® Boost and compelling power and noise reduction benefits through HybridPower™.

Hybrid SLI

SLI technology enables two discrete GPUs to work together and provide increased graphics performance. Hybrid SLI technology is similar to SLI technology in that it enables a *motherboard* GPU (**mGPU**) to work with a *discrete* GPU (**dGPU**) to provide two key benefits to the user.

❑ **GeForce Boost**
The GeForce Boost feature enables the motherboard GPU to work collaboratively with the discrete GPU to increase the performance of the discrete GPU. When GeForce Boost is enabled, the **m**GPU and **d**GPU share the rendering load by rendering different frames of an image. Thus the graphics processing power of the **m**GPU is harnessed to enhance the processing power of the **d**GPU.

❑ **HybridPower**
The HybridPower feature enables the user to switch off the **d**GPU when the maximum performance of the **d**GPU is not required and use the **m**GPU for non-intensive graphics applications, such as high definition DVD playback, Web surfing, and office productivity applications. Switching off the **d**GPU not only lowers the total system power consumption but also lowers total system noise and heat.

Hybrid SLI Requirements

- ❑ Hybrid SLI-enabled motherboard and discrete GPUs (go to www.nvidia.com/hybridSLI for a full list.)
- ❑ HybridPower-enabled power supply (go to www.nvidia.com/hybridSLI for a full list.)
- ❑ Windows Vista operating system
- ❑ At least 2GB of system memory
- ❑ Latest NVIDIA Graphics Driver from www.nvidia.com
- ❑ Systems BIOS programmed to enable Hybrid SLI (see next page)

Supported dGPUs

GeForce Boost

The GeForce Boost feature of Hybrid SLI works only with specific **d**GPUs whose performance is comparable with the **m**GPU. The list of **d**GPUs supported by the GeForce Boost feature can be found at www.nvidia.com/hybridsli.

Note: For best GeForce Boost performance, an AMD Phenom CPU that supports HT3 protocol is recommended.

HybridPower

The HybridPower feature is supported by specific **d**GPUs that are able to power down or enter into a low power state when the system enters **Save Power** mode, or stay on in **Boost Performance** mode. The list of the **d**GPUs supported by the HybridPower feature can be found at www.nvidia.com/hybridsli.

Multi-GPU SLI Support in Hybrid SLI Systems

Certain Hybrid SLI-enabled motherboards also support multi-GPU SLI set ups. In this case, SLI works as it normally does—with two or more GPUs connected to power one display. Connecting the display to the **m**GPU enables HybridPower and allows the user to enter **Save Power** mode. Note that when more than one **d**GPU is plugged into a Hybrid SLI system, the GeForce Boost feature is not available.
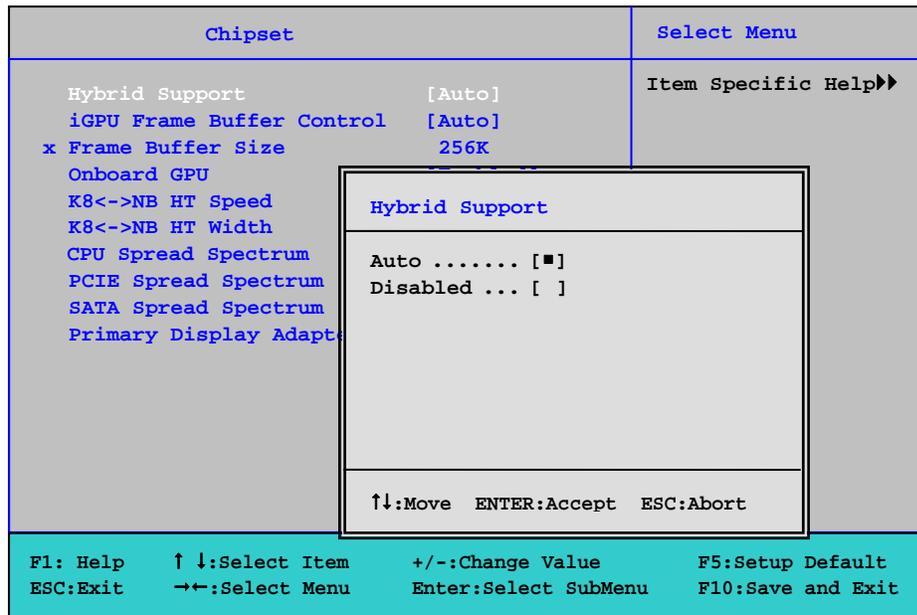
Enabling Hybrid SLI

Enabling HybridPower

To enable HybridPower, the switches that control Hybrid SLI must be set to the appropriate values in the **System BIOS settings**. Go into the system BIOS and go to **Advanced➔Chipset** to ensure that the following settings are set to the values given:

- ❑ **Hybrid Support:** ....**Enabled**
  This enables hybrid functionality in the BIOS.

- ❑ **Onboard or mGPU Enable:**...........**Enabled**
  When Hybrid is enabled, the Onboard GPU is automatically enabled.

- ❑ **Preferred or Primary Boot GPU:**...**mGPU**
  This sets the primary display adapter. For HybridPower, this must be set to **m**GPU.

- ❑ **mGPU Frame Buffer Control:**........**Manual**

- ❑ **mGPU Frame Buffer Size:** ....**256 MB**
  The Frame Buffer size must be set to a minimum of 256MB for Hybrid SLI.

Note: There may be differences in these menu items depending upon the manufacturer of your motherboard.

```
          Chipset                           Select Menu

                                      Item Specific Help▶▶
   Hybrid Support            [Auto]
   iGPU Frame Buffer Control [Auto]
 x Frame Buffer Size          256K
   Onboard GPU                      ┌─────────────────────────┐
   K8<->NB HT Speed                 │  Hybrid Support          │
   K8<->NB HT Width                 │                          │
   CPU Spread Spectrum              │  Auto ....... [■]        │
   PCIE Spread Spectrum             │  Disabled ... [ ]        │
   SATA Spread Spectrum             │                          │
   Primary Display Adapt            │                          │
                                    │                          │
                                    │                          │
                                    │  ↑↓:Move  ENTER:Accept  ESC:Abort │
                                    └─────────────────────────┘

 F1: Help    ↑ ↓:Select Item    +/-:Change Value    F5:Setup Default
 ESC:Exit    →←:Select Menu      Enter:Select SubMenu   F10:Save and Exit
```

☞ **IMPORTANT:** The menu items and options <u>will differ</u> depending on the motherboard manufacture' SBIOS. Therefore, the line item wording represented in this manual will more than likely *not* match what you may have.

Enabling GeForce Boost

To enable GeForce Boost, the switches that control Hybrid SLI must be set to the appropriate values in the System BIOS settings. Go into the system BIOS and go to **Advanced➔Chipset** to ensure that the following settings are set to the values given:

❑ **Hybrid Enable:** ....**Enabled**
This enables hybrid functionality in the BIOS.

❑ **Onboard or mGPU Enable:** .... **Enabled**
When Hybrid is enabled, the Onboard GPU is automatically enabled.

❑ **Preferred or Primary Boot GPU:** ...**mGPU**
This sets the primary display adapter. For GeForce Boost, this can be set to either the **m**GPU or the **d**GPU.

❑ **mGPU Frame Buffer Control:** ......**Manual**

❑ **mGPU Frame Buffer Size:** ....**256 MB**
The Frame Buffer size must be set to a minimum of 256MB for Hybrid SLI.

Note: There may be differences in these menu items depending upon the manufacturer of your motherboard.

When the System BIOS is setup correctly and the Hybrid SLI drivers are installed on a hybrid-enabled system, the Hybrid UI icon displays in the Windows Vista system tray.

Click the icon to display the Hybrid UI

Disabling Hybrid SLI

Traditional dGPU Mode

The Hybrid SLI feature can be disabled if desired by settings the appropriate Hybrid SLI switches in the System BIOS settings. The system can be put into the traditional operating mode where the discrete GPU performs all the graphics processing and drives the display. The motherboard GPU will be disabled in this mode. To disable Hybrid SLI and put the system in the traditional **d**GPU based operating mode, the following switches in the System BIOS settings must be set to the corresponding values given below. Go into the system BIOS and go to **Advanced➔Chipset** to ensure that the following settings are set to the values given:

❑ **Hybrid Enable:** ....**Disabled**
  This disables hybrid functionality in the BIOS.

❑ **Onboard or mGPU Enable:** ....**Disabled**
  When Hybrid is disabled, the Onboard GPU is automatically disabled.

❑ **Preferred or Primary Boot GPU:** ...**dGPU**
  This sets the primary display adapter. This is automatically set to **d**GPU when Hybrid is disabled.

❑ **mGPU Frame Buffer Control:** ....**Manual**

❑ **mGPU Frame Buffer Size:** ....**0 MB**
  The Frame Buffer size must be set to the lowest possible value when the Onboard/**m**GPU is disabled.

Note: There may be differences in these menu items depending upon the manufacturer of your motherboard.

Multi-adapter Mode

When Hybrid SLI is disabled, the system can be programmed to be in multi-adapter mode by enabling both the **d**GPU and **m**GPU. This will allow the user to connect displays to both the **m**GPU and the **d**GPU. The system can be put into multi-adapter mode by setting the appropriate Hybrid SLI switches in the System BIOS settings. Go into the system BIOS and go to **Advanced➔Chipset** to ensure that the following settings are set to the values given:

❑ **Hybrid Enable:** ....**Disabled**
This disables hybrid functionality in the BIOS.

❑ **Onboard or mGPU Enable:** ....**Enabled**
When Hybrid is disabled, the Onboard GPU is automatically disabled. The user must manually enable the **m**GPU to enable multi adapter mode.

❑ **Preferred or Primary Boot GPU:** ..**dGPU**
This sets the primary display adapter. This is automatically set to **d**GPU when Hybrid is disabled.

❑ **mGPU Frame Buffer Control:** ....**Auto**

❑ **mGPU Frame Buffer Size:** **128MB**

> **Note:** There may be differences in the menu items above depending upon the manufacturer of your motherboard.

Multi-adapter mode is also supported when Hybrid SLI is enabled. The system can be put in Multi-adapter mode through the Hybrid SLI User Interface. The Hybrid SLI User Interface chapter describes how the system can be put into Multi-adapter mode when Hybrid SLI is enabled.

Hybrid SLI
User Interface

The Hybrid SLI icon is placed in the system tray when Hybrid SLI is enabled in the system BIOS (Figure 1).
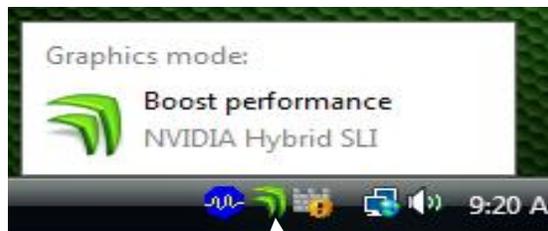
Figure 1.   Hybrid SLI UI in System Tray

Viewing the icon tells you which mode the system is currently in.

❑ **Performance** mode
   The entire icon is green

❑ **Save Power** mode
   Half the icon is lit (one arc is lit).

❑ **Additional Displays** mode
   Hybrid SLI is disabled

Another way to see what mode you are running in is to pause the mouse over the icon until the **Graphics mode** window displays.

Pause your mouse over the icon to display the Graphics mode window

Selecting a Hybrid Mode

Another way to see the current Hybrid mode of the system, and to change that mode, is to click on the Hybrid SLI icon to display the **Select a Hybrid SLI mode** window.

The options available on this window are:

❑ **Save Power** mode
This is the Hybrid SLI mode where the **d**GPU completely shuts off and the **m**GPU renders and drives the display

❑ **Boost Performance** mode
This is the Hybrid SLI mode where the **d**GPU and **m**GPU are simultaneously active and working collaboratively to provide higher performance.

❑ **Additional Displays** mode
Hybrid SLI is disabled in this mode. The **d**GPU and **m**GPU operate independently to support **Multi-Adapter** mode.

> **Note:** The Hybrid SLI control panel indicates when a hybrid mode change cannot be made due to open applications (see Figure 2). The Hybrid SLI control panel also indicates when the user-selected Hybrid State is not in sync with the Windows Vista Power Profile of the system

HybridPower Settings

Blocking Applications

❑ Transitioning from **Boost Performance** mode to **Save Power** mode and vice versa is allowed only when there are no open 3D applications. The Hybrid SLI control panel prevents the transition when there are open 3D applications.

❑ The Hybrid SLI control panel provides a list of applications that are blocking the Hybrid SLI transition and asks the user to close those applications to complete the transition (Figure 2).
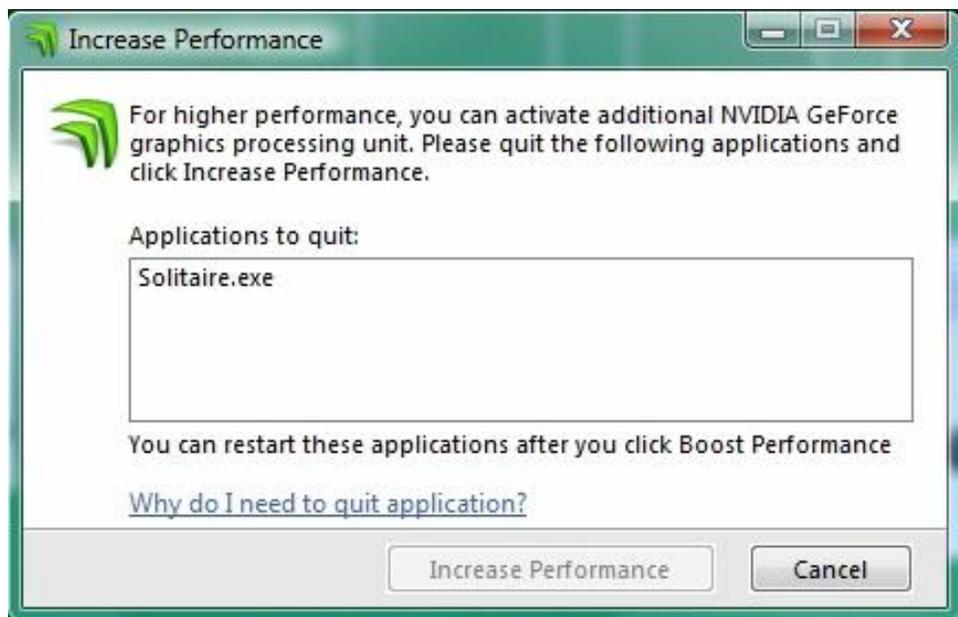

Figure 2.   Open 3D Applications Block Hybrid SLI Transition

Settings to Enable Automatic Save Power Mode

On a Hybrid SLI system that is capable of supporting **HybridPower** mode, the user can program the Hybrid API to automatically put the system into **Save Power** mode after four minutes of system idle. This is done through the Windows Vista Power Plan settings (Figure 3).
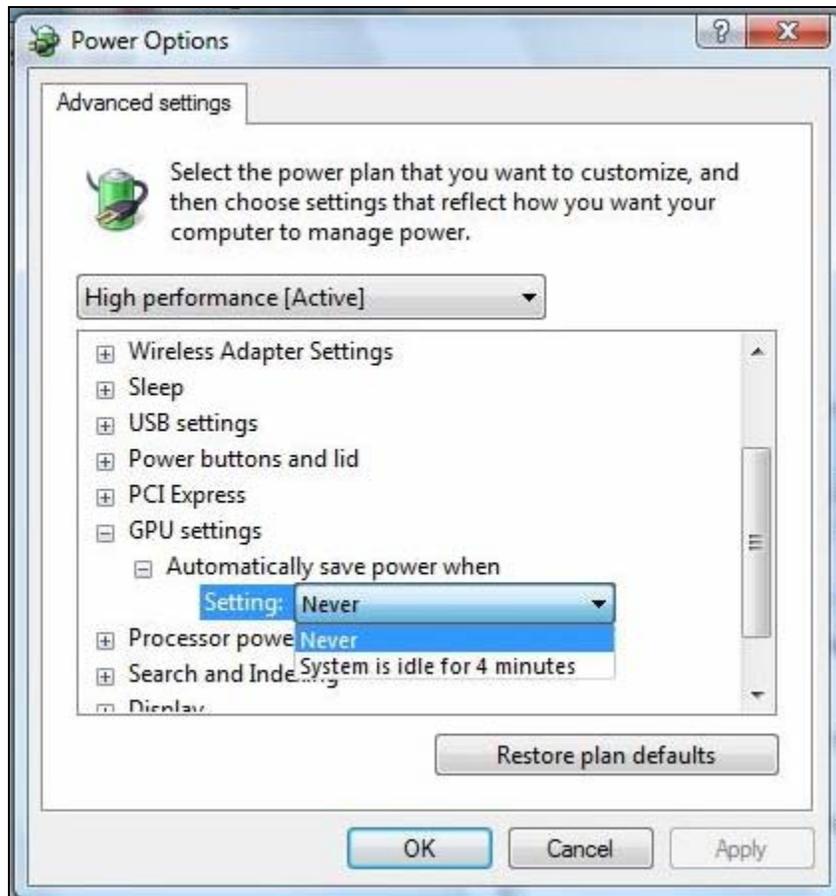
Figure 3.   Desktop Settings in Windows Vista Power Plan

Once the settings have been done in the Windows Vista Power Plan options, the NVIDIA driver automatically changes the system mode to **Save Power** after four minutes of WinIdle detection and saves the current Hybrid SLI mode. When WinIdle state is exited, the system automatically reverts back to the saved Hybrid SLI mode.

Connecting Displays to Hybrid SLI Systems

There are three use case examples in this section of Hybrid SLI technology.

Case 1: All Displays Connected to mGPU

Connecting one or two displays to your **m**GPU (Figure 4) is the ideal way to experience Hybrid SLI in most situations. Not only do you get the added performance boost from GeForce Boost (only on certain discrete GPUs), you also have the flexibility to switch between **Save Power** and **Performance** modes with the HybridPower feature (only on certain discrete GPUs). Table 1 lists the benefits of the Hybrid SLI modes.
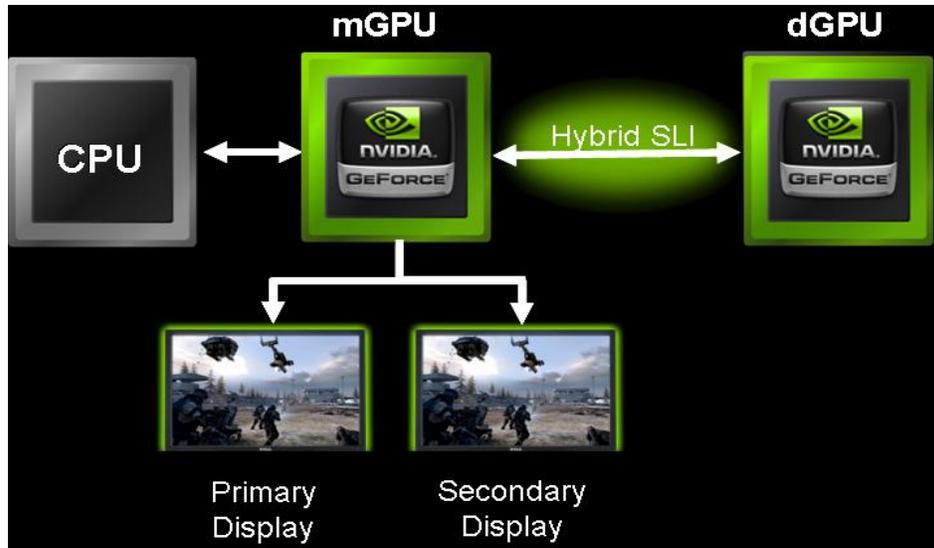
Figure 4.   Displays Connected to mGPU

Table 1.   HSLI Mode Benefits for Case 1

HSLI Mode	Enabled	Benefit
Performance	Yes	Additive GPU performance (Only on supported **d**GPUs. Refer to www.nvidia.com/hybridsli)
Save Power	Yes	Power Savings and lower noise due to **d**GPU shutdown (only on supported **d**GPUs. Refer to www.nvidia.com/hybridsli)

Case 2: All Displays Connected to dGPU

Connecting displays to the **d**GPU (Figure 5) disables **Save Power** mode but **Performance mode** will still be available (only with supported **d**GPUs) . Table 2 lists the benefits of the Hybrid SLI modes in this usage case
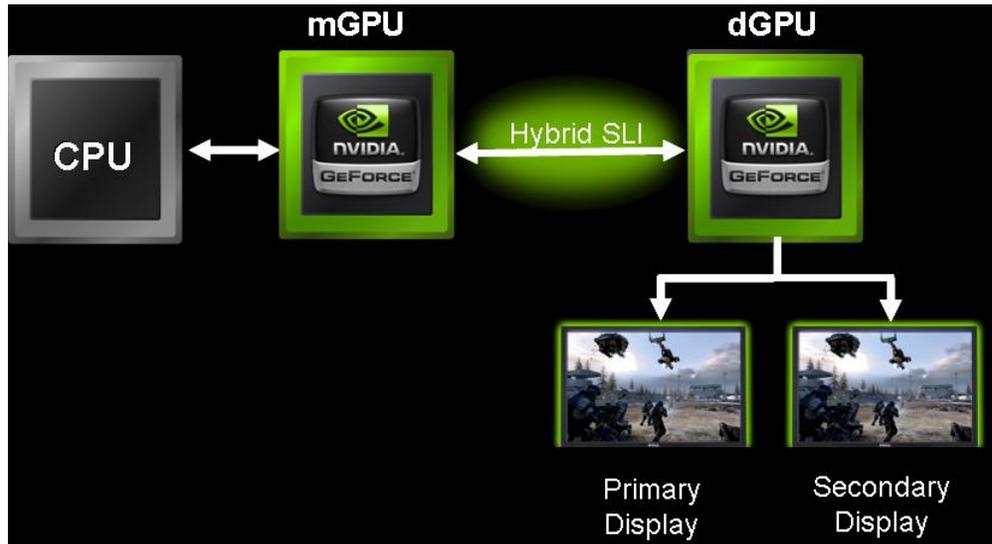

Figure 5.   All Displays Connected to dGPU

Table 2.   HSLI Mode Benefits for Case 2

HSLI Mode	Enabled	Benefit
Performance	Yes	Additive GPU performance (Only on supported **d**GPUs. Refer to www.nvidia.com/hybridsli)
Save Power	No	Not supported because **d**GPU must be turned on to drive display.

If you connect displays to both the **m**GPU and **d**GPU and enable multi-adapter mode through the Hybrid User Interface then the **Performance** mode is disabled. The **Performance** feature is only available when the system is not in multi-adapter mode.

Case 3: Displays Connected to Both the mGPU and the dGPU

Multi-adapter mode allows you to activate displays connected to both the **m**GPU (up to two displays) and the **d**GPU (up to two displays). Multi-adapter mode can be enabled either through the System BIOS or through the Hybrid User Interface. You can enable Multi-adapter mode through the Hybrid User Interface by selecting the **Additional Displays** option. You can enable Multi-adapter mode through the System BIOS by setting the SBIOS switches to the values described in *Disabling Hybrid SLI'* on page 5. Enabling Multi-adapter mode through the System BIOS disables the Hybrid SLI features and does not allow you to take advantage of the **GeForce Boost** or **HybridPower** features. This type of connection scenario is ideal only if you would like to always drive displays connected to the **m**GPU and the **d**GPU
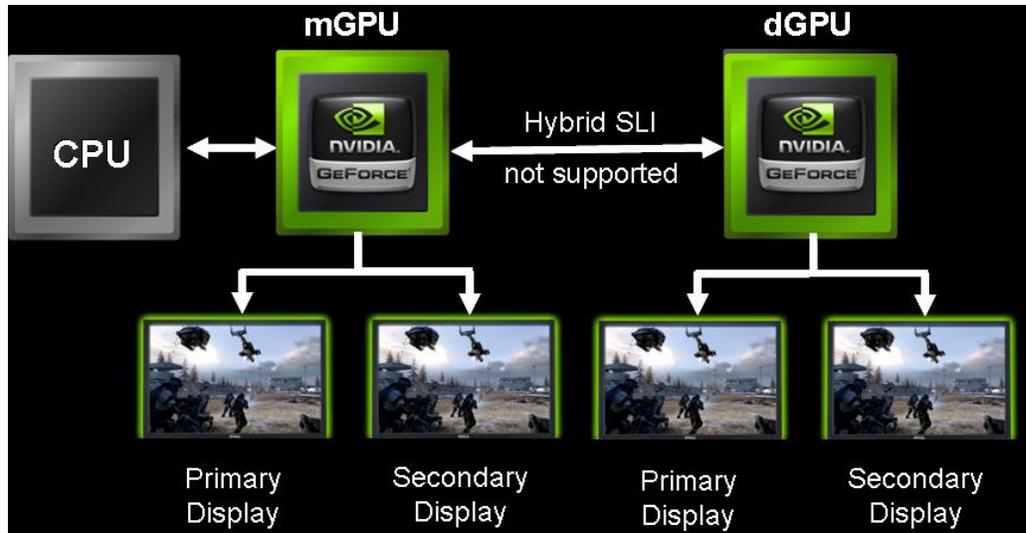
Figure 6.   Displays Connected to Both mGPU and dGPU

Table 3.   HSLI Mode Benefits for Case 3

HSLI Mode	Enabled	Benefit
Performance	No	Not supported. Each GPU functions as independent adapter
Save Power	No	Not supported. Each GPU functions as independent adapter and **d**GPU must be turned on for it to drive its displays

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Frequently Asked Questions

Q: Which OS supports Hybrid SLI?

A: Hybrid SLI is supported only by Windows Vista. It is currently not supported with any other operating system.

Q: What happens when a user tries to enable Hybrid SLI when the motherboard GPU is disabled?

A: If **m**GPU is disabled, Hybrid SLI will also be disabled. The display will have to be connected to the discrete GPU and the system will function like a non hybrid system.

Q: Will performance of GeForce Boost increase if the frame buffer size of mGPU is increased? Is there a minimum frame buffer size required for GeForce Boost?

A: The minimum frame buffer size of the **m**GPU required for **GeForce Boost** support is 256MB. The performance of **GeForce Boo**st depends on the processing powers of the **d**GPU and the **m**GPU and other system factors. For best scaling, a **d**GPU that is recommended for GeForce be used along with the a Hybrid SLI enabled motherboard GPU

Q: When one monitor is connected to the mGPU and one monitor is connected to the dGPU, can the dGPU still run at x16 mode?

A: Yes. The **d**GPU will be able to run at x16 mode.

Q: What is the maximum number of monitors that can be connected in a system that has onboard GPU and dGPU?

A: Two displays can be connected to the **m**GPU and two displays to the **d**GPU. When both display adapters are enabled, the system will be in multi adapter mode. Neither **GeForce Boost** nor **HybridPower** is supported when the system is in multi adapter mode.

Q: Will GeForce Boost performance increase if the dGPU or mGPU refreshes the display?

A: There are several variables that control the amount of scaling provided by **GeForce Boost**. **GeForce Boost** performance is comparable if either **d**GPU refreshes the display or **m**GPU refreshes display.

Q: Which hybrid mode should the user enter to best support HD DVD/Blu-ray playback?

A: Both **Boost Performance** and **Save Power** modes deliver excellent playback of HD DVD and Blu-ray DVD titles at full 1080p resolution. **Hybrid-Power** mode is recommended as it will offer the best acoustic and low power experience when watching high definition content.

Q: How do I know if my power supply supports HybridPower mode?

A: NVIDIA has been working with power supply manufacturers to test currently available power supplies as well as update future products to include support for **HybridPower**. The list of the power supplies supported by the HybridPower feature can be found at www.nvidia.com/hybridsli NVIDIA does not recommend using any power supplies not on the approved list.

Q: If I use a power supply that is not on the HybridPower approved power supply list, will it work with HybridPower mode?

A: Hybrid SLI systems should power up and run Windows Vista with most power supplies. However, your system may not function properly or can shut down if you attempt to enable Save Power mode.