

Application Note

**AMD Accelerated
Parallel Processing**
TECHNOLOGY

Running AMD Accelerated Parallel Processing Applications Remotely

1 Introduction

This application note describes the steps to take to successfully run your AMD Accelerated Parallel Processing application while remotely logged into your system.

AMD Accelerated Parallel Processing applications developed with the AMD Accelerated Parallel Processing SDK rely on CAL to manage the AMD GPU for general-purpose computations. AMD CAL uses existing API hooks into the display driver to access your GPU. This works transparently if you are running the AMD Accelerated Parallel Processing applications locally on the graphics console. However, additional care must be taken when trying to run the AMD Accelerated Parallel Processing applications while remotely logged into your system.

The steps and suggestions provided in this application note should work on a wide variety of systems. Use them as a guide, and make adjustments for your particular setup.

2 Description

When you run an AMD Accelerated Parallel Processing application locally on the graphics console, CAL has direct access to the display driver on your computer desktop. When you remotely log into your system over a network, your AMD Accelerated Parallel Processing applications no longer have the necessary access to the display driver, and CAL cannot properly access the GPU.

The most common ways to access computers remotely are:

- the Remote Desktop Protocol (RDP) under Windows
- Secure Shell (SSH) under Linux.

Under Windows, the RDP service takes over as the display driver for your system. This makes it impossible for CAL to access the GPU, since it no longer has access to the AMD display driver. Under Linux, default X Windows security settings prevent remote sessions from accessing the X server. Without access to the X server, which talks to the AMD display driver, CAL cannot access the GPU.

This poses a problem for any user trying access their system remotely using the methods above in order to run AMD Accelerated Parallel Processing applications. This is also an issue for users building a Linux cluster running MPI or other cluster software that relies on the ability to remotely log into the compute nodes to launch jobs on each node.

3 Solution Overview

The key to solving this problem is to allow your AMD Accelerated Parallel Processing application access to the AMD display driver, even while logged in remotely. The solution depends on the operating system you are running.

Under Windows, use an alternative remote desktop utility. There are many publicly available versions of remote desktop utilities online; these are based on the Virtual Network Computing (VNC).

Under Linux, modify the security settings to allow a remote-session access to the X server running on the system. Point remote sessions to the local X server when running AMD Accelerated Parallel Processing applications.

4 Solution Details

This section describes how to modify your system so that it runs your AMD Accelerated Parallel Processing applications when you are remotely logged in.

You must have installed the appropriate AMD display driver and AMD Accelerated Parallel Processing SDK on your system. Before proceeding, ensure that you run the `FindNumDevices` utility, located under the `samples\cal\bin` directory of your AMD Accelerated Parallel Processing SDK. The utility returns the number of detected compatible AMD GPUs in your system.

For a list of supported AMD GPUs, see the Supported Devices section of the Getting Started Guide, available through:
<http://developer.amd.com/sdks/AMDAPPSDK/documentation/Pages/default.aspx>.

If `FindNumDevices` does not return the correct number of compatible GPUs in your system, or if you are having trouble getting AMD Accelerated Parallel Processing SDK to install and function properly, visit <http://www.developer.amd.com/opencnforum>, or submit an AMD Accelerated Parallel Processing SDK help desk request at <http://www.developer.amd.com/appsdksupport>.

4.1 Microsoft Windows

To setup the Windows system to let you remotely log in and run AMD Accelerated Parallel Processing applications, install an alternative remote desktop utility that does not replace itself as the display driver on your system. The most commonly used utility is VNC. There are many versions of VNC based on the same core protocol:

- RealVNC (<http://www.realvnc.com>)
- UltraVNC (<http://www.uvnc.com>)
- TightVNC (<http://www.tightvnc.com>)

Fundamentally, most of the variations of VNC should be able to interoperate, as long you do not use the extensions that some of the variations provide. For this application note, we use UltraVNC.

1. **Download the latest version of UltraVNC** for your system.
2. **Log into your system from the graphical console as Administrator** or a user with Administrator-level permissions.

3. **Run the setup program for UltraVNC.**
 - a. When prompted to download the mirror driver, **uncheck “Download the mirror driver”**.
 - b. When prompted to select additional tasks, such as registering UltraVNC as a system service, **check “Register UltraVNC Server as a system service” and “Start restart UltraVNC service”**.
4. Once UltraVNC has installed and started up, there is a green icon with an eye in the lower right hand corner of your Windows desktop.
 - a. **Right-click on the icon, and select “Admin Properties”**.
 - b. **Set “VNC Password”** appropriately.
 - c. **Click “OK”** to commit your changes.
 - d. If you are presented with a “Run As” dialogue, **select “The following user:” and enter the user name and password of the Administrator** for the system and **click “OK”**.

If you do not already have UltraVNC installed on your remote client machine, install it now.

1. On your remote client, **start “UltraVNC Viewer”**.
2. **Fill in “VNC Server:” with the host name or IP address of the system** you just setup above.
3. **Click “Connect”** to initiate the connection.
4. You are presented with a password prompt. **Enter the appropriate password and click “OK”**.
5. If the previous steps were successfully completed, you are shown a window on your remote client that is an exact copy of your AMD Accelerated Parallel Processing system.
6. **Start a command prompt window and change your directory to the `samples\cal\bin` directory.**
 - a. **Run `FindNumDevices.exe`**.
 - b. `FindNumDevices` should return a “Device Count” equal to the number of compatible GPUs in your AMD Accelerated Parallel Processing system.
If you see the correct number of devices with `FindNumDevices`, you have successfully enabled your system to allow running AMD Accelerated Parallel Processing application remotely.

4.2 Linux

To setup a Linux system to let you remotely log in and run AMD Accelerated Parallel Processing applications, modify the security settings to allow a remote session access to the X server running on the system.

1. **Log into your system as root.**

2. If you are running **Red Hat Enterprise Linux or Ubuntu**:

- a. **Add the following lines at the end of `/etc/gdm/Init/Default`**, before the `exit 0`, to modify the security settings, allowing remote sessions to access the X server and ensuring that remote sessions have access to the necessary device files when communicating with the GPU:

```
xhost +  
chmod uog+rw /dev/ati/card*
```

- b. **If you normally use bash, add the following line to the end of `/etc/bashrc` file** to ensure remote sessions know which X server to access.

```
case $DISPLAY in '' ) export DISPLAY=:0;; *) ;; esac
```

NOTE: '' are two single quotes, **not** a single double-quote.

3. If you are running **openSUSE**:

- a. **Add the following lines at the end of `/etc/X11/xdm/Xsetup`** after the `./etc/sysconfig/displaymanager` to modify the security settings, allowing remote sessions to access the X server and to ensure remote sessions have access to the necessary device files when communicating with the GPU.

```
xhost +  
chmod uog+rw /dev/ati/card*
```

- b. **If you normally use bash, add the following line to the end of `/etc/bash.bashrc`** to ensure remote sessions know which X server to access.

```
case $DISPLAY in '' ) export DISPLAY=:0;; *) ;; esac
```

NOTE: '' are two single quotes, **not** a single double-quote.

4. **If you normally use tcsh, add the following line to the end of `/etc/csh.cshrc`** to ensure remote sessions know which X server to access.

```
if ( ! $?DISPLAY ) then  
    setenv DISPLAY :0  
endif
```

5. **Run `/usr/sbin/gdm-restart` (RHEL), `service gdm restart` (Ubuntu), or `kill` the xorg process (openSUSE) to force `gdm/kdm/xdm` to restart and pick up the new settings.**

This terminates your current X session; ensure all applications are closed and all data is saved properly before executing this command!

6. Ensure your X server restarts and remains the active console on your machine. If you accidentally end up at a text console, you can often get back to your X server console by pressing CTRL-ALT-F7. If your X server console is not the active console, your remote CAL applications wait for the X server to become active again.
7. **Log into your system remotely, and change to your `samples\cal\bin` directory.**
 - a. **Run `FindNumDevices`.**
 - b. `FindNumDevices` should return a "Device Count" equal to the number of compatible GPUs in your AMD Accelerated Parallel Processing system.

If the correct number of devices appears, you have successfully enabled your system to allow running AMD Accelerated Parallel Processing application remotely.

5 Conclusion

It is fairly easy to incorporate AMD Accelerated Parallel Processing technology into your remotely accessible system, or into a cluster of machines. By following the techniques outlined in this application note, you can modify your Windows or Linux system to let you remotely run you AMD Accelerated Parallel Processing applications on the system.

If your configuration is not the same as the ones used in this note, you can use the steps above as a starting point for modifying your setup to run AMD Accelerated Parallel Processing applications remotely.

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