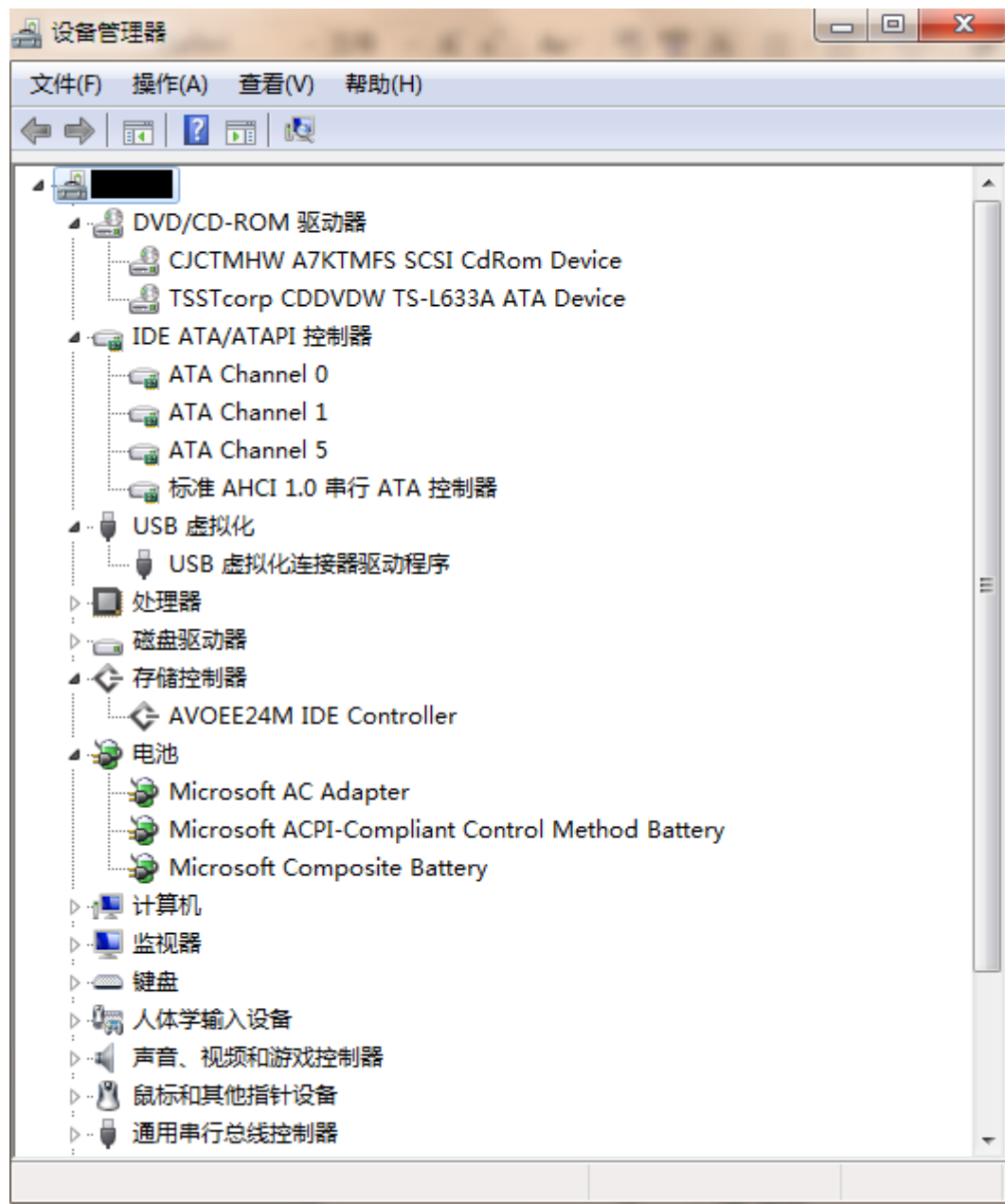


CS490 Windows Internals Labs

Dec 21th, 2013

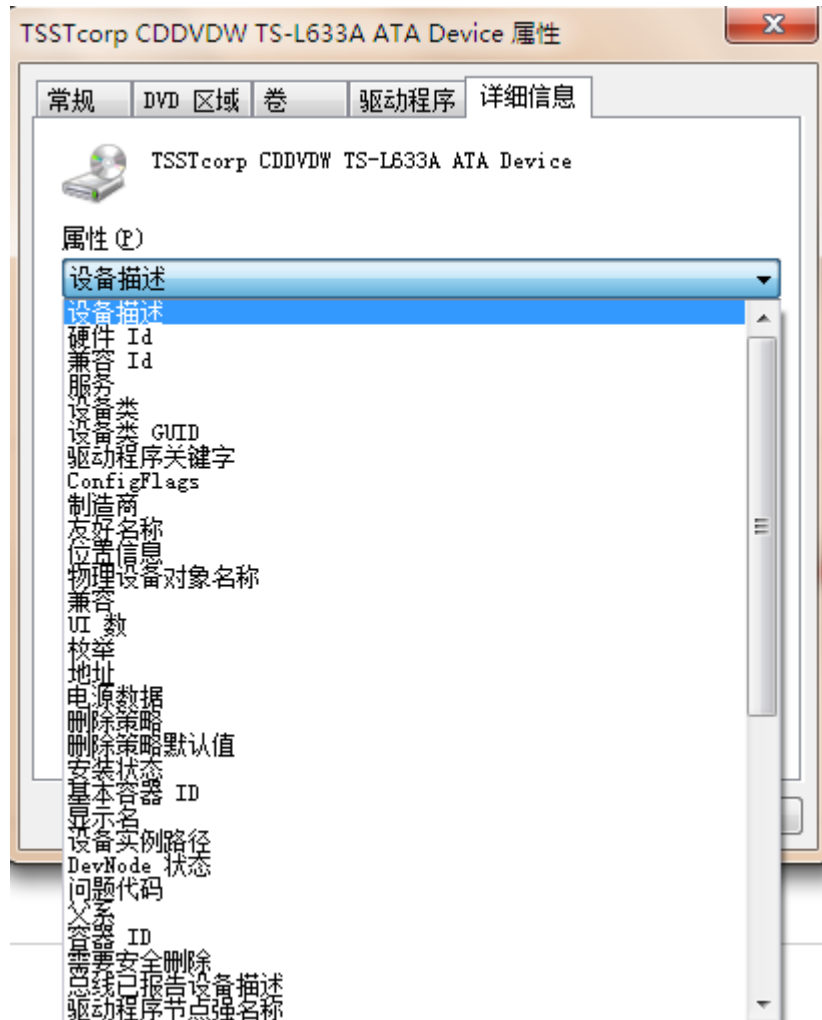
1. Viewing the Device Tree

In Windows, you can check the device tree on your computer very easily by using Device Manager. To bring up the device manager, you can access the **Hardware** tab of the **System** application in **Control Panel**.



In Windows Vista/7 you can find the Details tab after you double-clicked a device in device

manager. (In Windows XP/2003, you must set devmgr_show_details environment variable to a value of 1 to enable the Details tab). The tab allows you to view an assortment of fields including the devnode's device instance ID, hardware ID, service name, filters, and power capabilities.



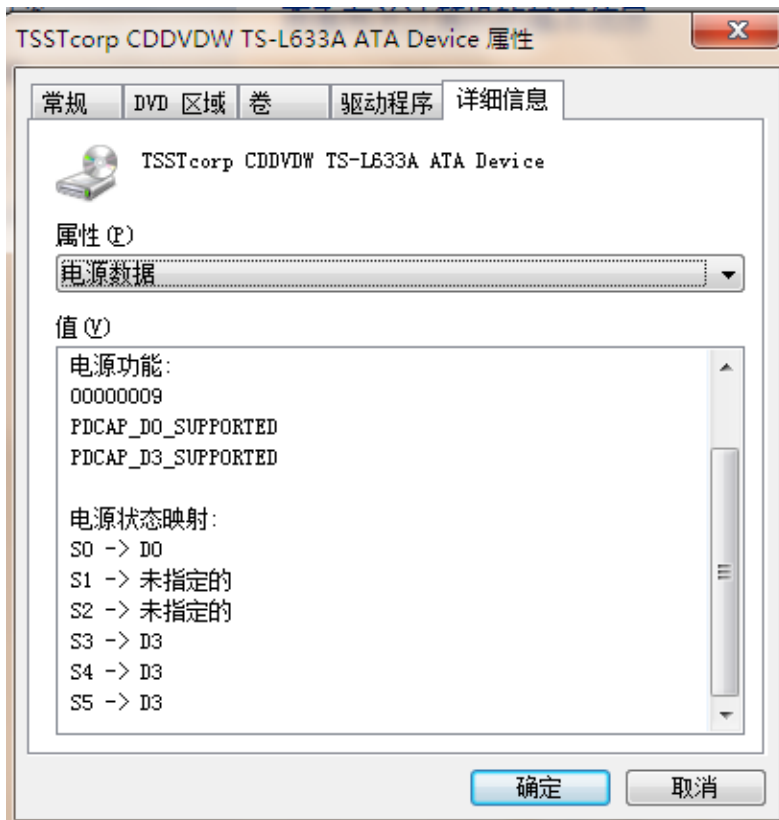
You can also view the device tree by using the !devnode kernel debugger command. Specifying 0 1 as command options dumps the internal device tree devnode structures, indenting entries to show their hierarchical relationships. (For more details, please check the help file for debugging tools for windows)

Kd>!devnode 0 1

```
管理员: C:\Windows\system32\cmd.exe - livekd
DevNode 0xfffffa8003d33d90 for PDO 0xfffffa8003d33060
InstancePath is "Root\volmgr\0000"
ServiceName is "volmgr"
State = DeviceNodeStarted (0x308)
Previous State = DeviceNodeEnumerateCompletion (0x30d)
DevNode 0xfffffa8004cd5930 for PDO 0xfffffa8004cd7cd0
InstancePath is "STORAGE\Volume\{47f148c2-1ea0-11df-bb24-806e6f6e6963}#000000000007E00"
ServiceName is "volsnap"
TargetDeviceNotify List - f 0xfffff8a00012aaa0 b 0xfffff8a0003fd6e0
State = DeviceNodeStarted (0x308)
Previous State = DeviceNodeEnumerateCompletion (0x30d)
DevNode 0xfffffa8004d41990 for PDO 0xfffffa8004d428e0
InstancePath is "STORAGE\VolumeSnapshot\HarddiskVolumeSnapshot1"
State = DeviceNodeStarted (0x308)
Previous State = DeviceNodeEnumerateCompletion (0x30d)
DevNode 0xfffffa8004cd7670 for PDO 0xfffffa8004cd7940
InstancePath is "STORAGE\Volume\{47f148c2-1ea0-11df-bb24-806e6f6e6963}#0000009D7A00000"
ServiceName is "volsnap"
TargetDeviceNotify List - f 0xfffff8a00012aea0 b 0xfffff8a00009c6f0
State = DeviceNodeStarted (0x308)
Previous State = DeviceNodeStartPostWork (0x307)
DevNode 0xfffffa8004cd73f0 for PDO 0xfffffa8004cd5060
InstancePath is "STORAGE\Volume\{47f148c2-1ea0-11df-bb24-806e6f6e6963}#000000000007E00"
```

2. Viewing a Driver's Power Mappings

In Windows, you can see a driver's system power state to driver power state mappings with Device Manager. Open the Properties dialog box for a device, and choose the Power Data entry in the drop-down list of the Details tab to see the mappings. The dialog box also displays the current power state of the device, the device-specific power capabilities that it provides, and the power states from which it is able to wake the system.



3. Viewing the System Power Capabilities and Policy

You can view a computer's system power capabilities by using the !pocaps kernel debugger command. Here's the output of the command when run on an ACPI-compliant laptop running Windows 7:

```
0: kd> !pocaps
PopCapabilities @ 0xffffffff8000482e080
Misc Supported Features: PwrButton S1pButton Lid S3 S4 S5 HiberFile FullWake
VideoDim
Processor Features: Thermal
Disk Features: SpinDown
Battery Features: BatteriesPresent
  Battery 0 - Capacity: 0 Granularity: 0
  Battery 1 - Capacity: 0 Granularity: 0
  Battery 2 - Capacity: 0 Granularity: 0
Wake Caps
Ac OnLine Wake: Sx
Soft Lid Wake: Sx
RTC Wake: S4
Min Device Wake: Sx
Default Wake: Sx
0: kd>
```

The Misc Supported Features line reports that, in addition to S0 (fully on), the system supports system power states S1, S3, S4, S5 (it doesn't implement S2) and has a valid hibernation file to which it can save system memory when it hibernates (state S4).

You can change the system's power policy in **Power Options** page which can be accessed from **Control Panel**. The exact properties you can configure depend on the system's power capabilities.



You can display the system's power policy by using !popolicy debugger command. Here's an output of the command on the same system.

Kd>!popolicy

```
0: kd> !popolicy
SYSTEM_POWER_POLICY (R.1) @ 0xfffff8000481fe74
PowerButton:      None   Flags: 00000000   Event: 00000010
SleepButton:      Hibernate Flags: 00000000   Event: 00000000
LidClose:         None   Flags: 00000000   Event: 00000000
Idle:             Sleep  Flags: 00000000   Event: 00000000
OverThrottled:    None   Flags: 00000000   Event: 00000000
IdleTimeout:      0      IdleSensitivity: 90%
MinSleep:         S3     MaxSleep:         S3
LidOpenWake:      S0     FastSleep:        S0
WinLogonFlags:    1      S4Timeout:        0
VideoTimeout:     0      VideoDim:          0
SpinTimeout:      0      OptForPower:       0
FanTolerance:     0%     ForcedThrottle:    0%
MinThrottle:      0%     DyanmicThrottle:   None (0)
0: kd> _
```

The first lines of the display correspond to the button behaviors sepcified on the Advanced Settings tab of Power Options. In this system, the PowerButton do nothing and SleepButton do Hibernate.

The timeout values correspond to the settings you can see configured on the Power Options page. In this system, the video timeout is 0 which means never turn off the monitor.