DEVICE DRIVERS AND TERRUPTS SERVICE MECHANISM

Lesson-14: Device types, Physical and Virtual device functions

Device Types

- For each type of device, there is a set of the generic commands.
- For example, for char device one set of commands and for block device there can be another set.

Device Types

- Types of Physical and Virtual devices in a system may be as follows:

char, block, loop back device, file, pipe, socket, RAM disk, sound, video and media.

Virtual device driver

- Definition : A virtual-device driver is the component of a device driver that communicates directly between an application and memory or a physical device.
- Virtual device driver controls the flow of data
- Allows more than one application to access the same memory or physical device without conflict.

Char Device

- Char Device: For example, a device to which one character is sent at one time or is read from it at one time. For example, mouse, keyboard, keypad, timer .

Block Device

- Block Device: For example, a device to which one block of characters is sent at one time or is read from it at one time. For example, printer, disk.

Block Device configuration as Char Device

- Block as well as Char device: For example, a device to which one block of characters or a single character is sent at one time or is read from it at one time. For, example, LCD display unit. A device can be configured as char or block as per the need by a generic command.

Configuration as loop-back Device

- Loop-back Device: A device to which one character or set of characters are sent, and those are echoed back to same.

Configuration as copy Device

- Copy Device: A device using which a set of characters are sent, and those are returned to another device. For example, disk_copy device when characters are copied from one disk to another or a keyboard-cum-display device. Keyboard input is sent to a buffer and display unit uses that buffer for display.

Virtual Devices

- Besides the physical devices of a system, drivers are also used in a systems for virtual devices.
- Physical device drivers and virtual device drivers have analogies.
- Like physical device, virtual device drivers may also have functions for device connect or open, read, write and close.

Driver

- A memory block can have data buffers for input and output in analogy to buffers at an IO device and can be accessed from a *char* driver or *block* or *pipe* or *socket* driver.

Virtual Device Examples

- Pipe device: A device from to which the blocks of characters are send from one end and accessed from another ends in FIFO mode (first-in first-out) after a connect function is executed to connect two ends.

Virtual Device Examples ...

- Socket device: A device from to which (a) the blocks of characters are send from one end with a set of the port (application) and sender addresses, (b) accessed from another end port (application) and receiver addresses, (c) access is in FIFO mode (first-in first-out) only after a connect function is executed to connect two sockets.

Virtual Device Examples...

- File device: A device from which the blocks of characters are accessed similar to a disk in a tree like format (folder, subfolder,...). For example, a named file at the memory stick.

Virtual Device Examples

- RAM disk Device: A set of RAM memory blocks used like a disk, which is accessed by defining addresses of directory, subdirectory, second level subdirectory, folder and subfolder

Difference between various types of virtual devices

- Pipe needs one address at an end,
- Socket one addresses and one port number at an end, and
- File and disk can have multiple addresses. Reading and writing into a file is from or to current cursor address in the currently open folder.

- Just as a file is sent *read* call, a device must be sent a driver command when its input buffer(s) is to be read.
- Just as a file is sent *write* call, a device needs to be sent a driver command when its output buffer is to be written.

Virtual device example for Remote System access

- A **virtual device** example is a device description that is used to form a connection between a user and a physical system networked or connected to a remote system.

Virtual device driver File name (VxD)

- Driver filename in Windows OS is used where the V stands for virtual and D stands for device.The “d" can be replaced with other characters; for example, VdD means a display driver.

Linux Internals and Device Drivers and Linux Network Functions

- Linux has internal functions called *Internals*. Internals exist for the device-drivers and network-management functions.
- Useful *Linux drivers* for the embedded system and gives the uses of each.

Linux drivers

- Char (For driving a character)
- Block (For driving a block of char)
- Input (For standard IO devices)
- Media (For standard media device functions)
- Video (For standard video device functions)
- Sound (For standard auido device functions)

Linux drivers in the *net* directory

The Linux internal functions exist for

- Sockets,
- Handling of Socket buffers,
- firewalls,
- network Protocols (for examples, NFS, IP, IPv6 and Ethernet) and
- bridges.

- They work separately as drivers and also form a part of the network management function of the operating system.

Summary

We learnt

- Physical and virtual devices
- Drivers for virtual devices are also written similar to the physical device drivers
- Use the same generic commands.
- Device Types : char, block, loop back, file device, pipe, socket, RAM disk, sound, video and media.
- Device examples are char device, block device, loop back device, file device, pipe, socket and RAM disk

We learnt

- Linux operating system has internals and a large number of readily available device drivers for the most common physical and virtual devices and has the functions for the network sockets and protocols

End of Lesson 14 of Chapter 4