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Diasy-chaining: IEEE 1394 and USB

The Dirt on Daisy-chaining

INFO from LAVA

What is daisy-chaining?

Simply put, daisy-chaining is a bus wiring scheme in which devices are wired A to B to C.

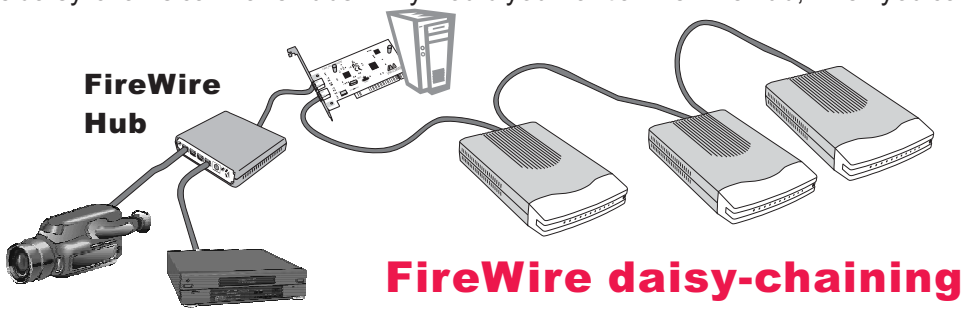
Discussions and marketing materials on the newer bus technologies - FireWire (IEEE 1394) and USB 1.1 and 2.0 - frequently describe these technologies as "permitting daisy-chaining up to xxx devices." In the case of IEEE 1394, the number is cited as 63; in the case of USB the number is 127. What does this mean? Is USB the better technology?

Answering these questions requires a little in-depth understanding of the differences between USB and IEEE 1394.

Daisy-chaining IEEE 1394

FireWire/IEEE 1394 devices generally are supplied with in- and out-ports that can be used to daisy-chain up to 63 such devices. When IEEE 1394 devices are chained, a peer-to-peer network is created among the devices on the chain. This means that no single node on the network is required to control the data traffic, leading to efficient bandwidth use. Imagine a FireWire daisy chain running from a computer to a 1394 hard disk – a Lava FireDrive –, then to a second FireDrive. The computer's software could initiate a file transfer between the two drives in the daisy chain, and then it would be no longer needed: the computer could even be unplugged and the file transfer would continue. Unlike USB, IEEE 1394 doesn't require a third device to mediate between connected peripherals – they can talk directly to each other. In addition, two computers can share a peripheral, which isn't possible with USB or other I/O protocols.

While they don't need them, FireWire daisy-chains can have hubs. Why would you want a FireWire hub, when you can daisy-chain without one? Two reasons: first, adding a hub to the IEEE 1394 topology allows removing a device in the daisy chain without interrupting the operation of other devices in the chain. Second, as with USB, continually adding unpowered devices to a IEEE 1394 daisy chain will eventually over-tax the power available in the system. Adding a powered hub or repeater will supplement the power in the system as a whole.

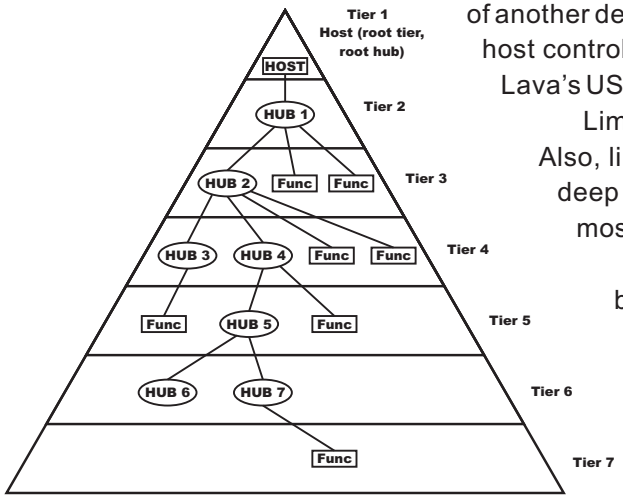


FireWire daisy-chaining

A final point about IEEE 1394 daisy-chaining: Sony's flavor of IEEE 1394 (called iLink™) uses a modified version of the IEEE 1394 cable. The standard IEEE 1394 cable has six wires, two of which carry power to bus-powered devices. Sony's cable eliminates those two wires, and so devices like digital video cameras with iLink connections need their own power source. When daisy-chaining using IEEE 1394, place any devices using iLink cabling at the end of the chain; otherwise, bus-powered devices downstream of the four-wire cable will not receive power.

Daisy-chaining USB

First off, USB devices always daisy-chain using hubs. USB devices are never connected device-to-device (although it might look that way if a device also has a built-in hub). This is because, for the purposes of daisy-chaining, USB has three main components: a USB host controller (the interface between the USB system and the computer), hubs, and "functions" (think of these as devices or peripherals). With USB, peripherals are connected to the USB host controller only through hubs. Also, hubs can be connected to other hubs.



USB bus topology

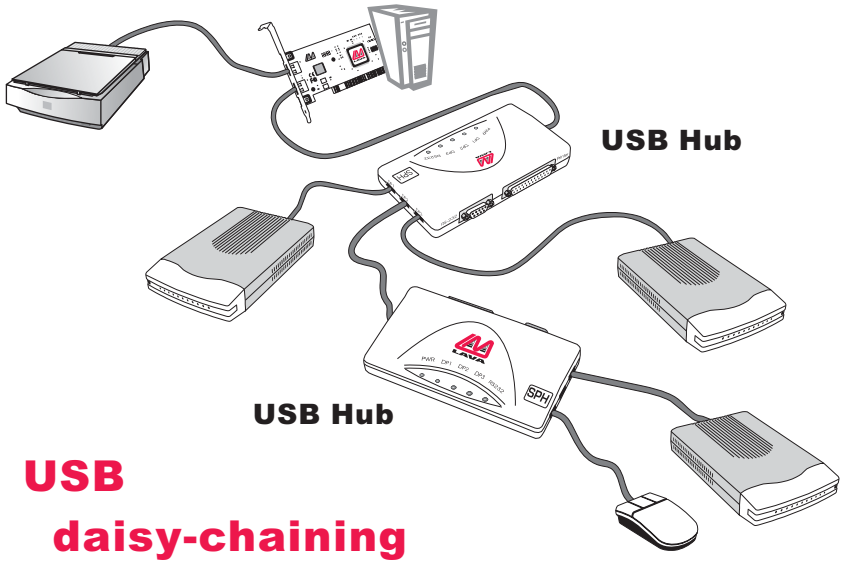
Hubs can be stand-alone products – like the downstream ports on a Lava SPH-USB 1.1 Hub – or they can be a part of another device, such as a monitor or keyboard. In fact, a motherboard with two USB ports often really has one USB host controller and a two-port hub, all together on the computer's motherboard. Similarly, PCI host adapters like Lava's USB 1.1 or 2.0 Host Adapters are actually host controller/hub combinations.

Limits exist to USB daisy-chaining. The device address maximum of 127 functions in a USB system is one. Also, limits on how quickly messages can travel through cables and hubs restrict the nesting of hubs to five deep (not counting the host controller). Generally, these are not problems to users: 127 devices are more than most people need in a system.

A second, more restrictive limit, is that devices attached to a USB system share the system's bandwidth. Adding more peripherals to the chain gives less bandwidth per peripheral (the rules on precisely how bandwidth is shared go beyond this discussion).

A third limit is electrical. USB, like FireWire, supplies limited electrical power to devices. The more devices, the less power available for each. When plugging in many bus-powered peripherals, or bus-powered peripherals that draw significant current, self-powered hubs like the Lava SPH-USB hub are necessary to ensure there's enough power to go around.

Finally, when mixing USB 1.1 and USB 2.0 systems remember that a USB 2.0 device will slow to USB 1.1 speeds if a USB 1.1 hub is in the chain between it and a USB 2.0 host controller.



USB daisy-chaining

Profile File

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Lavalites (People who work here)

One of the newest talents in Lava's sales force is Junshen Wang. Junshen speaks both English and Mandarin Chinese, and is building Lava's Asian markets.

Junshen moved to Canada five months ago from California (wait till winter, Junshen!). Junshen's interests include computers, photography, and web design, and he is currently creating a web site showing pictures of his wedding and honeymoon.

The Source for Ports

LAVA

To add yourself or another to the LAVANews mailing list please send an e-mail to sales@lavalink.com.

Lava at COMDEX Fall 2001 in Las Vegas

See us in the Lava booth at COMDEX Fall, November 12-16 in the Las Vegas Convention Center. We will be in the Canada Pavilion, Booth L7162.

Send in a completed Lava Survey and qualify to win a Lava SPH-USB Hub. Now you can get daisy-chaining!

Win!

The Kazan USB 2.0 Drive Enclosure was a hot prize!
Congratulations to the draw's winner:
Emmanuel Elkoubi of C.E. Informatique, St-Eustache, Quebec.