Describing and referring to LEDs in ACPI

Individual LEDs are described by hierarchical data extension [5] nodes under the device node, the LED driver chip. The "reg" property in the LED specific nodes tells the numerical ID of each individual LED output to which the LEDs are connected. [leds] The hierarchical data nodes are named "led@X", where X is the number of the LED output.

Referring to LEDs in Device tree is documented in [video-interfaces], in "flash-leds" property documentation. In short, LEDs are directly referred to by using phandles.

While Device tree allows referring to any node in the tree [devicetree], in ACPI references are limited to device nodes only [acpi]. For this reason using the same mechanism on ACPI is not possible. A mechanism to refer to non-device ACPI nodes is documented in [data-node-ref].

ACPI allows (as does DT) using integer arguments after the reference. A combination of the LED driver device reference and an integer argument, referring to the "reg" property of the relevant LED, is used to identify individual LEDs. The value of the "reg" property is a contract between the firmware and software, it uniquely identifies the LED driver outputs.

Under the LED driver device, The first hierarchical data extension package list entry shall contain the string "led@" followed by the number of the LED, followed by the referred object name. That object shall be named "LED" followed by the number of the LED.

Example

An ASL example of a camera sensor device and a LED driver device for two LEDs is show below. Objects not relevant for LEDs or the references to them have been omitted.

```
Device (LED)
{
        Name (_DSD, Package () {
                ToUUID("dbb8e3e6-5886-4ba6-8795-1319f52a966b"),
                Package () {
                        Package () { "led@0", LED0 },
                        Package () { "led@1", LED1 },
                }
        })
        Name (LED0, Package () {
                ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                Package () {
                        Package () { "reg", 0 },
                        Package () { "flash-max-microamp", 1000000 },
                        Package () { "flash-timeout-us", 200000 },
                        Package () { "led-max-microamp", 100000 },
                        Package () { "label", "white:flash" },
                }
        })
        Name (LED1, Package () {
                ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                Package () {
                        Package () { "reg", 1 },
                        Package () { "led-max-microamp", 10000 },
                        Package () { "label", "red:indicator" },
                }
        })
}

Device (SEN)
{
        Name (_DSD, Package () {
                ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                Package () {
                        Package () {
                                "flash-leds",
                                Package () { ^LED, "led@0", ^LED, "led@1" },
                        }
                }
        })
}
```

where

```
LED     LED driver device
LED0    First LED
LED1    Second LED
SEN     Camera sensor device (or another device the LED is related to)
```

References

[acpi] Advanced Configuration and Power Interface Specification.
https://uefi.org/specifications/ACPI/6.4/, referenced 2021-11-30.

[data-node-ref] Documentation/firmware-guide/acpi/dsd/data-node-references.rst

[devicetree] Devicetree. https://www.devicetree.org, referenced 2019-02-21.

[dsd-guide] DSD Guide.
https://github.com/UEFI/DSD-Guide/blob/main/dsd-guide.adoc, referenced 2021-11-30.

[leds] Documentation/devicetree/bindings/leds/common.yaml

[video-interfaces] Documentation/devicetree/bindings/media/video-interfaces.yaml