MDIO bus and PHYs in ACPI

The PHYs on an MDIO bus [phy] are probed and registered using fwnode_mdiobus_register_phy().

Later, for connecting these PHYs to their respective MACs, the PHYs registered on the MDIO bus have to be referenced.

This document introduces two _DSD properties that are to be used for connecting PHYs on the MDIO bus [dsd-properties-rules] to the MAC layer.

These properties are defined in accordance with the "Device Properties UUID For _DSD" [dsd-guide] document and the daffd814-6eba-4d8c-8a91-bc9bbf4aa301 UUID must be used in the Device Data Descriptors containing them.

phy-handle

For each MAC node, a device property "phy-handle" is used to reference the PHY that is registered on an MDIO bus. This is mandatory for network interfaces that have PHYs connected to MAC via MDIO bus.

During the MDIO bus driver initialization, PHYs on this bus are probed using the _ADR object as shown below and are registered on the MDIO bus.

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-guide][acpi][dsd]phy.rst, line 30)

Cannot analyze code. No Pygments lexer found for "none".

```
.. code-block:: none

      Scope(\_SB.MDI0)
      {
        Device(PHY1) {
          Name (_ADR, 0x1)
        } // end of PHY1

        Device(PHY2) {
          Name (_ADR, 0x2)
        } // end of PHY2
      }
```

Later, during the MAC driver initialization, the registered PHY devices have to be retrieved from the MDIO bus. For this, the MAC driver needs references to the previously registered PHYs which are provided as device object references (e.g. _SB.MDI0.PHY1).

phy-mode

The "phy-mode" _DSD property is used to describe the connection to the PHY. The valid values for "phy-mode" are defined in [ethernet-controller].

managed

Optional property, which specifies the PHY management type. The valid values for "managed" are defined in [ethernet-controller].

fixed-link

The "fixed-link" is described by a data-only subnode of the MAC port, which is linked in the _DSD package via hierarchical data extension (UUID dbb8e3e6-5886-4ba6-8795-1319f52a966b in accordance with [dsd-guide] "_DSD Implementation Guide" document). The subnode should comprise a required property ("speed") and possibly the optional ones - complete list of parameters and their values are specified in [ethernet-controller].

The following ASL example illustrates the usage of these properties.

DSDT entry for MDIO node

The MDIO bus has an SoC component (MDIO controller) and a platform component (PHYs on the MDIO bus).

a) Silicon Component This node describes the MDIO controller, MDI0 ----------

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-

guide][acpi][dsd]phy.rst, line 80)

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```
.. code-block:: none

        Scope(_SB)
        {
          Device(MDI0) {
            Name(_HID, "NXP0006")
            Name(_CCA, 1)
            Name(_UID, 0)
            Name(_CRS, ResourceTemplate() {
              Memory32Fixed(ReadWrite, MDI0_BASE, MDI_LEN)
              Interrupt(ResourceConsumer, Level, ActiveHigh, Shared)
               {
                 MDI0_IT
               }
            }) // end of _CRS for MDI0
          } // end of MDI0
        }
```

b) Platform Component The PHY1 and PHY2 nodes represent the PHYs connected to MDIO bus MDI0 ----------

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-guide][acpi][dsd]phy.rst, line 102)

Cannot analyze code. No Pygments lexer found for "none".

```
.. code-block:: none

        Scope(\_SB.MDI0)
        {
          Device(PHY1) {
            Name (_ADR, 0x1)
          } // end of PHY1

          Device(PHY2) {
            Name (_ADR, 0x2)
          } // end of PHY2
        }
```

DSDT entries representing MAC nodes

Below are the MAC nodes where PHY nodes are referenced. phy-mode and phy-handle are used as explained earlier. ----------

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-guide][acpi][dsd]phy.rst, line 122)

Cannot analyze code. No Pygments lexer found for "none".

```
.. code-block:: none

        Scope(\_SB.MCE0.PR17)
        {
          Name (_DSD, Package () {
             ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                 Package () {
                     Package (2) {"phy-mode", "rgmii-id"},
                     Package (2) {"phy-handle", \_SB.MDI0.PHY1}
               }
           })
        }

        Scope(\_SB.MCE0.PR18)
        {
          Name (_DSD, Package () {
            ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                Package () {
                    Package (2) {"phy-mode", "rgmii-id"},
                    Package (2) {"phy-handle", \_SB.MDI0.PHY2}}
```

```
            }
          })
        }
```

MAC node example where "managed" property is specified.

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-guide][acpi][dsd]phy.rst, line 149)

Cannot analyze code. No Pygments lexer found for "none".

```
.. code-block:: none

        Scope(\_SB.PP21.ETH0)
        {
          Name (_DSD, Package () {
             ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                 Package () {
                     Package () {"phy-mode", "sgmii"},
                     Package () {"managed", "in-band-status"}
                 }
           })
        }
```

MAC node example with a "fixed-link" subnode.

System Message: WARNING/2 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\firmware-guide\acpi\dsd\[linux-master][Documentation][firmware-guide][acpi][dsd]phy.rst, line 165)

Cannot analyze code. No Pygments lexer found for "none".

```
.. code-block:: none

        Scope(\_SB.PP21.ETH1)
        {
          Name (_DSD, Package () {
            ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                 Package () {
                     Package () {"phy-mode", "sgmii"},
                 },
            ToUUID("dbb8e3e6-5886-4ba6-8795-1319f52a966b"),
                 Package () {
                     Package () {"fixed-link", "LNK0"}
                 }
          })
          Name (LNK0, Package(){ // Data-only subnode of port
            ToUUID("daffd814-6eba-4d8c-8a91-bc9bbf4aa301"),
                 Package () {
                     Package () {"speed", 1000},
                     Package () {"full-duplex", 1}
                 }
          })
        }
```

References

[phy] Documentation/networking/phy.rst

[dsd-properties-rules]
Documentation/firmware-guide/acpi/DSD-properties-rules.rst

[ethernet-controller]
Documentation/devicetree/bindings/net/ethernet-controller.yaml

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