Devicetree Overlay use at Juniper Networks

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System Overview

- PTX5000 Packet Transport Router
  - Routing Engine
    - Routing protocols, administrative tasks
    - Interfaces to other cards in the system
  - 8 x FPC (Flexible PIC Concentrator)
    - 2 x PIC per FPC
  - Control Board
    - 9 x SIB (Switch Interface Board) per CB
  - All cards identified using I2C EEPROMs
  - Card connectors use multiple interface types
    - I2C, GPIO, PCIe, SERDES, ...
  - Various CPU types
    - P2020, P5020, P5040, x86
Devicetree overlay use

- All OIR capable cards managed with devicetree overlays
  - RE
    - FPCs, Fan tray, power supply, ...
  - FPC
    - PICs
  - Control Board
    - SIBs
- Each card represented as 'connector' node in devicetree data
'connector' nodes

pic0 {
    compatible = "jnx,pic-connector", "simple-bus";
    slot = <0>;
    auto-enable;
    ovname = "jnx_pic0", "jnx_pic0_pwr";
    presence-detect-gpios = <&gpio20 148 0x1>; /* active low */
    attention-button-gpios = <&gpio20 150 0x1>; /* active low */
    power-enable-gpios = <&gpio20 154 0x0>; /* active high */
    power-status-gpios = <&gpio20 151 0x0>; /* active high */
    reset-gpios = <&gpio20 153 0x1>; /* active low */
    power-enable-timeout = <2000>; /* in ms */
    attention-button-holdtime = <3000>; /* in ms */
    activation-timeout = <5000>; /* in ms */
    debounce-interval = <1>;
    led-green = <&pic0_green>;
    led-red = <&pic0_red>;

    i2c-bus {
        #address-cells = <1>;
        #size-cells = <0>;

        i2c-parent = <&pic0i2c>;

        eeprom@54 {
            compatible = "atmel,24c02";
            reg = <0x54>;
            ideeprom;
        };
    };
};
Connector driver

• Functionality
  – Manages card insertion and removal
  – Responsible for loading and removing devicetree overlays
  – State machine with 10 states and 12 events

• Status
  – Reliably loads and removes overlays
  – Some limitations and concerns
Limitations

• Power management
  – After enabling power, chips may be immediately visible on bus
    • PCIe: hotplug driver attempts to load driver before overlay is loaded
  – Kind of solved by using layered overlays
    • First overlay inserted after card identified, prior to enabling power
    • Second overlay inserted after power enabled and stable
Limitations

• Indirect target support
  – Currently requires information within overlay for each slot
  – Problematic if card is re-used in a different chassis
  – Limited scalability
  – Proposal: Simplify API by providing reference(s) from calling code
    • of_overlay_indirect() gets reference(s) instead of slot number as parameter
Limitations

- No DT / DT Overlay support on x86
  - Mandatory for us
  - Other solutions either not feasible or not scalable
    - ACPI
      - Not supported on all architectures
      - No overlays
    - Platform data is clumsy
      - Requires new driver / code for each new card
    - Card management from user space does not work
      - Yes, we tried ...
      - Implemented and working with small patch set on top of upstream kernel