Devicetree Evolution

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Agenda

● What is Devicetree?
● Current status
● Spreading further, more users
● Evolving and improving
● Next steps - DTE project
What is Devicetree?

- Method to describe a hardware platform
- Needed for non-discoverable hardware devices
  - Very diverse Arm ecosystem
  - Similar to ACPI
- Allows for a single kernel image
- First discussed 2008-2009, required since 2012
- Early boards didn't include DTBs
  - Short-term solution: include them with Linux
- More information:
  - [https://www.devicetree.org/](https://www.devicetree.org/)
  - [https://elinux.org/Device_Tree_Reference](https://elinux.org/Device_Tree_Reference)
Current status

- Lots of devices now provide DTB from firmware
- .dts files live under arch/arm, arch/arm64 in the kernel tree
- Largely hierarchical organisation of .dts and .dtsi files

Diagram:
- board.dts
  - Includes
    - module.dtsi
    - carrier.dtsi
    - expansion.dtsi
  - Describes hardware common to several platforms
- SoC.dtsi
  - Includes
  - Describes hardware common to several platforms
Spreading further, more users

Used by several OSes, firmwares and subsystems in addition to Linux

- **Bootloaders and firmware:**
  - U-Boot, Tianocore (UEFI), Barebox
- **Other OS kernels**
  - FreeBSD, NetBSD
- **RTOS**
  - Zephyr

Sometimes a combination of these on the same platform in parallel

- Multiple CPU complexes in the same SoC
- Cortex-A booting via U-Boot, running Linux
- Cortex-M running RTOS for embedded application
- FPGA running other application-specific code
Evolving and Improving

Time to extend and improve Devicetree to meet evolved needs

- **System View**
  - One complete view of the system, not just for Linux on the Cortex-A cores
  - Single Point of Truth for all components
  - Code generation for RTOS

- **Shared DT database for all users**
  - Move .dts files etc. out of the Linux kernel to a new repo

- **Tools**
  - Verification and validation of dts files
  - Better support for users modifying DTs

- **DT lifecycle**
  - Support for runtime identification of DT
  - Overlays

- **Specification updates**
Next steps - DTE project

Linaro Devicetree Evolution Lead Project

- [https://www.linaro.org/engineering/core/devicetree-evolution/](https://www.linaro.org/engineering/core/devicetree-evolution/)
- Driven by Linaro members, sharing engineering resources
- Multiple initiatives, spread across multiple groups in Linaro
  - Kernel, LEDGE, LITE, Security, OpenAMP
- Working in the open to improve the ecosystem
- Meetings later this week
- Engineering work in next cycle
- White paper:
Thank you

Join Linaro to accelerate deployment of your Arm-based solutions through collaboration

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