Devicetree Evolution
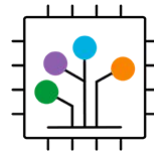
Steve McIntyre, Arm
Bill Fletcher, Linaro
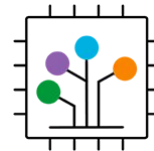
Agenda

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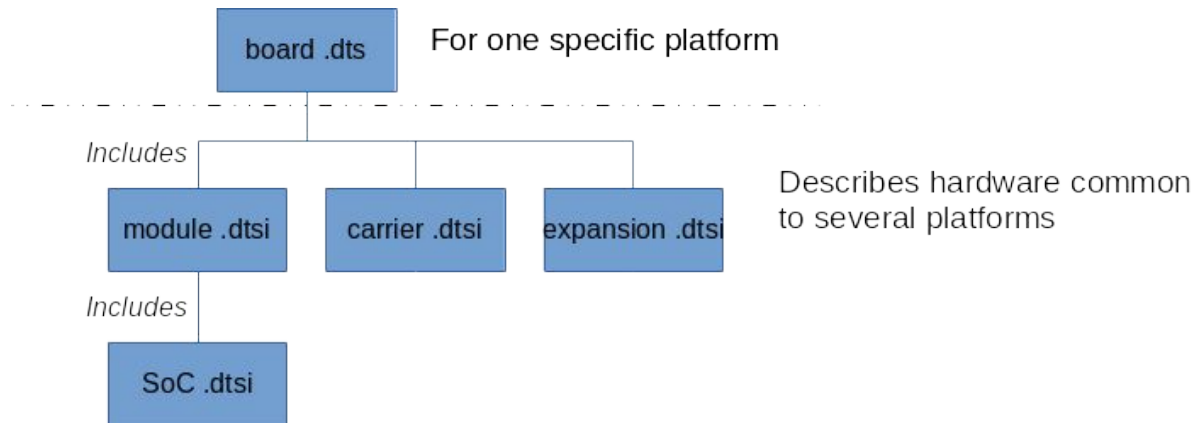- Next steps - DTE project

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/
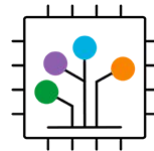 - https://elinux.org/Device_Tree_Reference

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

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
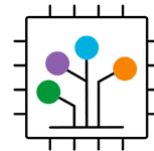- FPGA running other application-specific code

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/
- 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:
  - https://www.linaro.org/assets/pdf/Linaro-White-Paper--Device-Tree-Evolution.pdf

Thank you

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

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Linaro
connect
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