

Devicetree BOF

ELC 2017
Portland, Oregon

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Agenda

- questions, comments, issues, concerns from the crowd
 - Plumbers 2017
 - Plumbers 2016
 - Devicetree Specification
 - documentation
 - Build warnings
 - Overlays
 - Status of debug tools
-

What do you want to talk about?

questions

comments

issues

concerns

Linux Plumbers Conference 2017

Los Angeles, CA

Sept 13 - 15

with: Open Source Summit, Sept 11 - 13

Would you attend a Devicetree session?

Plumbers:

- focus on solving problems
- rather than presenting status

<https://www.linuxplumbersconf.org/2017/>

Plumbers 2016 Summary

Device Tree Schema Verification

Grant Likely (slides and etherpad)

Hardware Description vs Configuration vs Policy

(slides and etherpad)

Overlays

(etherpad)

Slides:

http://elinux.org/Device_tree_future#presentation_material_2

Etherpad Notes:

http://elinux.org/Device_tree_plumbers_2016_etherpad

Devicetree Specification

Devicetree Specification 0.1 supersedes ePAPR for the Linux kernel, continues to evolve

<https://www.devicetree.org/specifications/>

Mail list, Build Instructions, etc

<https://www.devicetree.org/collaborate/>

Repository

<https://github.com/devicetree-org/devicetree-specification>

Devicetree Documentation

elinux.org/Device_Tree_Reference

- becoming more complete
- contributions and comments welcome

device tree man pages, as of Linux 4.7-rc2

http://elinux.org/Device_Tree_Linux#Linux_Man_pages

man pages update and submittal to mainline
delayed by kernel switch to sphinx

Devicetree Build Warnings

Rob has been enhancing dtc error checks

Enabled for “W=1” builds

```
$ make V=0 W=1 qcom-apq8074-dragonboard.dtb
```

```
make[1]: Entering directory `/local/frowand_nobackup/src/git_linus/build/dragon_linus_4.10'
```

```
  DTC  arch/arm/boot/dts/qcom-apq8074-dragonboard.dtb
```

```
Warning (unit_address_vs_reg): Node /memory has a reg or ranges property, but no unit name
```

```
Warning (unit_address_vs_reg): Node /soc/spmi@fc4cf000/pm8941@0/vadc@3100/die_temp
```

```
Warning (unit_address_vs_reg): Node /soc/spmi@fc4cf000/pm8941@0/vadc@3100/ref_625m
```

```
Warning (unit_address_vs_reg): Node /soc/spmi@fc4cf000/pm8941@0/vadc@3100/ref_1250v
```

```
Warning (unit_address_vs_reg): Node /soc/spmi@fc4cf000/pm8941@0/vadc@3100/ref_gnd h
```

```
Warning (unit_address_vs_reg): Node /soc/spmi@fc4cf000/pm8941@0/vadc@3100/ref_vdd h
```

```
make[1]: Leaving directory `/local/frowand_nobackup/src/git_linus/build/dragon_linus_4.10'
```


Overlays

Pantelis's base dtc patches

- expose “internal representation”
- in git.kernel.org/pub/scm/utils/dtc/dtc.git
- expected in Linux 4.11

Pantelis's patch to hide “internal representation”

- not yet accepted

Overlays

- U-Boot overlay support
- Connectors (sockets and plugs)
- Overlay Managers
 - capemgr

Overlays

- Examples of use cases
 - beaglebone
 - raspberry pi
 - minnowboard
 - C.H.I.P.
 - Arduino
 - seeedstudios Grove 4 pin connectors
 - others?
- FPGA

Overlays

- Combinatorial explosion of .dts / .dtb files

example:

Devicetree Hardware Autoconfiguration

Hans de Goede

ELC Europe 2016

Debug Tools

scripts/dtc/dtx_diff

- diff .dts, .dtb, /proc/device-tree/
- pre-process includes into a single .dts
- merged in 4.6-rc1

scripts/dtc/dt_to_config

- drivers and kernel config needed by a device tree
- merged in 4.8-rc1

Kernel Configuration Info

```
dt_to_config \
  arch/arm/boot/dts/qcom-apq8074-dragonboard.dts \
  --short-name \
  --config ${KBUILD_OUTPUT}/.config \
  --config-format \
  > dragon_config_info
```

```
$ grep -i coincell dragon_config_info
```

```
# -d-c-----n--F : coincell@2800 : qcom,pm8941-coincell : drivers/misc/qcom-coincell.c : CONFIG_QCOM_COINCELL : n
# CONFIG_QCOM_COINCELL is not set
# CONFIG_QCOM_COINCELL=y
```

```
# -d-c-----n--F : coincell@2800 : qcom,pm8941-coincell : .....
# CONFIG_QCOM_COINCELL is not set
# CONFIG_QCOM_COINCELL=y
```

Debug Tools

scripts/dtc/dt_prop

- Compare properties accessed on target system vs a device tree (dtX)
- available on elinux.org
- Plan to submit to mail list “any day now”

dt_prop example snippets

```
$ dt_prop --td dmesg_4.5-rc5_160307_2100 qcom-apq8074-dragonboard.dts
```

```
# --- dmesg_4.5-rc5_160307_2100  
# +++ qcom-apq8074-dragonboard.dts  
/dts-v1/;
```

```
                // ***** i2c@f9964000 disabled *****  
i2c@f9964000 {  
+                 #address-cells;  
+                 #size-cells;  
+                 clock-names;  
+                 clocks;  
+                 compatible;  
+                 interrupts;  
+                 reg;  
+                 status;  
};
```


Debug Tools

dt_node_info, dt_stat

- Provide info about device tree nodes from /proc/device-tree files
- proof of concept on elinux.org
- Stalled, awaiting some of Frank's bandwidth

dt_node_info example 1

```
$ dt_node_info coincell
```

```
==== devices
```

```
==== nodes
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

```
==== nodes bound to a driver
```

```
==== nodes with a device
```

```
==== nodes not bound to a driver
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

```
==== nodes without a device
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

dt_node_info example 2

```
$ dt_node_info coincell
```

```
==== devices
```

```
/sys/devices/platform/soc/fc4cf000.spmi/spmi-0/0-00/
```

```
==== nodes
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

```
==== nodes bound to a driver
```

```
==== nodes with a device
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

```
==== nodes not bound to a driver
```

```
/soc/spmi@fc4cf000/pm8941@0/qcom,coincell@2800 qcom,
```

```
==== nodes without a device
```

Debug Tools

dtc: dts source location annotation

- Provide source locations from .dts & .dtsi
- Several proof of concept versions on devicetree-compiler list
- Stalled, awaiting some of Frank's bandwidth

source location annotation

----- short format -----

```
sdhci@f9824900 { /* qcom-apq8074-dragonboard.dts:14 */
    compatible = "qcom,sdhci-msm-v4"; /* qcom-msm8974.dtsi:240 */
    reg = <0xf9824900 0x11c 0xf9824000 0x800>; /* qcom-msm8974.dtsi:241 */
    reg-names = "hc_mem", "core_mem"; /* qcom-msm8974.dtsi:242 */
    interrupts = <0x0 0x7b 0x0 0x0 0x8a 0x0>; /* qcom-msm8974.dtsi:243 */
    interrupt-names = "hc_irq", "pwr_irq"; /* qcom-msm8974.dtsi:244 */
    clocks = <0xd 0xd8 0xd 0xd7>; /* qcom-msm8974.dtsi:245 */
    clock-names = "core", "iface"; /* qcom-msm8974.dtsi:246 */
    status = "ok"; /* qcom-apq8074-dragonboard.dts:17 */
    bus-width = <0x8>; /* qcom-apq8074-dragonboard.dts:15 */
    non-removable; /* qcom-apq8074-dragonboard.dts:16 */
}; /* qcom-apq8074-dragonboard.dts:18 */
```

THE END

Thank you for your participation...

Questions?

Comments?

Resources

http://elinux.org/Device_Tree_presentations_papers_articles

http://elinux.org/Device_Tree_presentations_papers_articles#debug

http://elinux.org/Device_Tree_Reference

Resources

dtx_diff

dtc --annotate

dt_node_info

Solving Device Tree Issues:

Frank Rowand, elce 2015

http://elinux.org/images/0/04/Dt_debugging_elce_2015_151006_0421.pdf

(In this presentation, dtx_diff was named dtdiff.)

Supporting material for: Solving Device Tree Issues:

http://elinux.org/Device_Tree_frowand

section: Embedded Linux Conference Europe (ELCE) - October 6, 2015

dt_to_config

Solving Device Tree Issues - Part 2:

Frank Rowand, LinuxCon Japan 2016

http://elinux.org/images/5/50/Dt_debugging_part_2.pdf

Resources

dt_prop

Solving Device Tree Issues - Part 3:

Frank Rowand, elce 2016

http://elinux.org/images/e/e5/Dt_debugging_part_3.pdf

Supporting material for: Solving Device Tree Issues - Part 3:

kernel patches

scripts/dtc/dts_diff

scripts/dtc/dt_prop

http://elinux.org/Device_Tree_frowand

section: Resources for "Solving Device Tree Issues - Part 3" talk

How to get a copy of the slides

- 1) frank.rowand@sony.com
 - 2) http://elinux.org/Device_Tree
 - 3) <http://events.linuxfoundation.org>
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