全 志 科 技
Allwinner Technology

A64

A64 uboot 调试说明书

文档履历

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目　　录

1. 概述

1.1. 编写目的

介绍 uboot 中，在控制台修改 device tree 配置的方法，为 uboot 和内核的使用者提供参考。

1.2. 适用范围

适用于 allwinnertech 使用了 device tree 技术系列平台。

1.3. 相关人员

uboot 开发/维护人员，内核开发人员。（需要对 device tree 有一定的了解）

2. Uboot FDT 命令说明

2.1. FDT

FDT：flattened device tree 的缩写

在 UBOOT 控制台停下后，输入 fdt，可以查看 fdt 命令帮助

```
sunxi#fdt
fdt - flattened device tree utility commands
Usage:
fdt addr [-c]  <addr> [<length>]     - Set the [control] fdt location to <addr>
fdt move     <fdt> <newaddr> <length> - Copy the fdt to <addr> and make it active
fdt resize                           - Resize fdt to size + padding to 4k addr
fdt print    <path> [<prop>]         - Recursive print starting at <path>
fdt list     <path> [<prop>]         - Print one level starting at <path>
fdt get value <var> <path> <prop>    - Get <property> and store in <var>
fdt get name <var> <path> <index>    - Get name of node <index> and store in <var>
fdt get addr <var> <path> <prop>     - Get start address of <property> and store in <var>
fdt get size <var> <path> [<prop>]   - Get size of [<property>] or num nodes and store in <var>
fdt set      <path> <prop> [<val>]   - Set <property> [to <val>]
fdt mknode <path> <node>             - Create a new node after <path>
fdt rm       <path> [<prop>]         - Delete the node or <property>
fdt header                           - Display header info
fdt bootcpu <id>                     - Set boot cpuid
fdt memory <addr> <size>             - Add/Update memory node
fdt rsvmem print                     - Show current mem reserves
fdt rsvmem add <addr> <size>         - Add a mem reserve
fdt rsvmem delete <index>            - Delete a mem reserves
fdt chosen [<start> <end>]           - Add/update the /chosen branch in the tree
                                       <start>/<end> - initrd start/end addr
fdt save                             - write fdt to flash
NOTE: Dereference aliases by omiting the leading '/', e.g. fdt print ethernet0.
sunxi#
```

注：

其中常用的命令就是 fdt list 和 fdt set

Fdt list 用来查询节点配置

Fdt set 用来修改节点配置

3. 查询配置

首先确定要查询的字段在 device tree 的路径，如果不知道路径，则需要用 fdt 命令查询:

3.1. 第一步：在根目录下查找

```
sunxi#fdt list   /
/ {
        model = "sun50iw1p1";
        compatible = "arm,sun50iw1p1", "arm,sun50iw1p1";
        interrupt-parent = <0x00000001>;
        #address-cells = <0x00000002>;
        #size-cells = <0x00000002>;
        ......................
        cpuscfg {
        };
        ion {
        };
        dram {
        };
        memory@40000000 {
        };
        interrupt-controller@1c81000 {
        };
        sunxi-chipid@1c14200 {
        };
        timer {
        };
        pmu {
        };
        dvfs_table {
        };
        dramfreq {
        };
        gpu@0x01c40000 {
        };
        wlan {
        };
```

```
        bt {
        };
        btlpm {
        };
};
```

如果找到需要的配置，比如 wlan 的配置，运行如下命令即可

```
sunxi#fdt list /wlan                    //注意路径中的 /
wlan {
        compatible = "allwinner,sunxi-wlan";
        clocks = <0x00000096>;
        wlan_power = "vcc-wifi";
        wlan_io_regulator = "vcc-wifi-io";
        wlan_busnum = <0x00000001>;
        status = "okay";
        device_type = "wlan";
        wlan_regon = <0x00000077 0x0000000b 0x00000002 0x00000001 0xffffffff 0xffffffff
0x00000000>;
        wlan_hostwake = <0x00000077 0x0000000b 0x00000003 0x00000006 0xffffffff 0xffffffff
0x00000000>;
};
```

3.2. 第二步： 在 soc 目录下找

如果在第一步中没有发现要找的配置，比如 nand0 的配置，则该配置可能在 soc 目录下

```
sunxi#fdt list /soc
soc@01c00000 {
        compatible = "simple-bus";
        #address-cells = <0x00000002>;
        #size-cells = <0x00000002>;
        ranges;
        device_type = "soc";
       ......................
        hdmi@01ee0000 {
        };
        tr@01000000 {
        };
        pwm@01c21400 {
        };
```

```
        nand0@01c03000 {
        };
        thermal_sensor {
        };
        cpu_budget_cool {
        };
        ......................
};
```

然后用如下命令显示即可:

```
sunxi#fdt list /soc/nand0
nand0@01c03000 {
        compatible = "allwinner,sun50i-nand";
        device_type = "nand0";
        reg = <0x00000000 0x01c03000 0x00000000 0x00001000>;
        interrupts = <0x00000000 0x00000046 0x00000004>;
        clocks = <0x00000004 0x0000007e>;
        pinctrl-names = "default", "sleep";
        pinctrl-1 = <0x00000081>;
        nand0_regulator1 = "vcc-nand";
        nand0_regulator2 = "none";
        nand0_cache_level = <0x55aaaa55>;
        nand0_flush_cache_num = <0x55aaaa55>;
        nand0_capacity_level = <0x55aaaa55>;
        nand0_id_number_ctl = <0x55aaaa55>;
        nand0_print_level = <0x55aaaa55>;
        nand0_p0 = <0x55aaaa55>;
        nand0_p1 = <0x55aaaa55>;
        nand0_p2 = <0x55aaaa55>;
        nand0_p3 = <0x55aaaa55>;
        status = "disabled";
        nand0_support_2ch = <0x00000000>;
        pinctrl-0 = <0x000000a9 0x000000aa>;
};
```

3.3. 使用路径别名查找

别名是 device tree 中完整路径的一个简写，有一个专门的节点(/aliases)来表示别名的相关信息,用如下命令可以查看系统中别名的配置情况：

```
sunxi#fdt list /aliases
aliases {
        serial0 = "/soc@01c00000/uart@01c28000";
       ..............
        mmc0 = "/soc@01c00000/sdmmc@01c0f000";
        mmc2 = "/soc@01c00000/sdmmc@01C11000";
        nand0 = "/soc@01c00000/nand0@01c03000";
        disp = "/soc@01c00000/disp@01000000";
        lcd0 = "/soc@01c00000/lcd0@01c0c000";
        hdmi = "/soc@01c00000/hdmi@01ee0000";
        pwm = "/soc@01c00000/pwm@01c21400";
        boot_disp = "/soc@01c00000/boot_disp";
};
sunxi#
```

由于配置了 nand0 节点的路径别名，因此可以用如下命令来显示 nand0 的配置信息

```
sunxi#fdt list nand0
nand0@01c03000 {
        compatible = "allwinner,sun50i-nand";
        device_type = "nand0";
        reg = <0x00000000 0x01c03000 0x00000000 0x00001000>;
        ..................
        pinctrl-names = "default", "sleep";
        pinctrl-1 = <0x00000081>;
};
```

注：在 fdt 的所有命令中，别名可用 path 字段

```
fdt list    <path> [<prop>]                 - Print one level starting at <path>
fdt set     <path> <prop> [<val>]       - Set <property> [to <val>]
```

4. 修改配置

4.1. 修改整数配置

命令格式：fdt set path prop <xxx>
示例： fdt set /wlan wlan_busnum <0x2>

```
sunxi#fdt list /wlan
wlan {
        compatible = "allwinner,sunxi-wlan";
        clocks = <0x00000096>;
        wlan_power = "vcc-wifi";
        wlan_io_regulator = "vcc-wifi-io";
        wlan_busnum = <0x00000001>;
        status = "disable";
        device_type = "wlan";
};
sunxi#fdt set /wlan wlan_busnum <0x2>
sunxi#fdt list /wlan
wlan {
        compatible = "allwinner,sunxi-wlan";
        clocks = <0x00000096>;
        wlan_power = "vcc-wifi";
        wlan_io_regulator = "vcc-wifi-io";
        wlan_busnum = <0x00000002>;     //修改后
        status = "disable";
        device_type = "wlan";
};
```

注：修改整数时，根据需要也可配置为数组形式，需要用空格来分隔
命令格式：fdt set path prop <0x1 0x2 0x3>

4.2. 修改字符串配置

命令格式：fdt set path prop "xxxxx"
示例： fdt set /wlan status "disable"

```
sunxi#fdt list /wlan
wlan {
        compatible = "allwinner,sunxi-wlan";
        clocks = <0x00000096>;
        wlan_power = "vcc-wifi";
        wlan_io_regulator = "vcc-wifi-io";
        wlan_busnum = <0x00000001>;
        status = "okay";
        device_type = "wlan";
```

```
};
sunxi#fdt set /wlan status "disable"
sunxi#fdt list /wlan
wlan {
        compatible = "allwinner,sunxi-wlan";
        clocks = <0x00000096>;
        wlan_power = "vcc-wifi";
        wlan_io_regulator = "vcc-wifi-io";
        wlan_busnum = <0x00000001>;
        status = "disable";                    //修改后
        device_type = "wlan";
};
sunxi#
```

注：修改字符串时，根据需要也可配置为数组形式，需要用空格来分隔

命令格式：fdt set path prop "string1" "string2"

5. GPIO 或者 PIN 配置特殊说明

5.1. port 接口对应的数字编号说明

#define PA 0
#define PB 1
#define PC 2
#define PD 3
#define PE 4
#define PF 5
#define PG 6
#define PH 7
#define PI 8
#define PJ 9
#define PK 10
#define PL 11
#define PM 12
#define PN 13
#define PO 14
#define PP 15
#define default 0xffffffff

5.2. Sysconfig 中描述 gpio 的形式

Sysconfig 中描述 gpio 的形式：
Port:端口+组内序号<功能分配><内部电阻状态><驱动能力><输出电平状态>

5.3. Pin 配置说明：

Pinctrl 节点分为 cpux 和 cpus，对应的节点路径如下：
Cpux : /soc/pinctrl@01c20800
Cpus: /soc/pinctrl@01f02c00

5.3.1. 查看 PIN 配置

5.3.1.1. PIN 配置属性字段说明

<allwinner,function>对应于 sysconfig 中的主键名
<allwinner,pins>对应于 sysconfig 中每个 gpio 配置中的端口名.
<allwinner,pname>对应于 sysconfig 中主键下面子键名字
<allwinner,muxsel>， <allwinner,pull>，<allwinner,drive>，<allwinner,data>这些属性分别表示<功能分配><内部电阻状态><驱动能力><输出电平状态>，其中值为 0xffffffff 表示使用默认值。

5.3.1.2. 查看 cpux 的 PIN 配置

```
sunxi#fdt list /soc/pinctrl@01c20800/lcd0
lcd0@0 {
        linux,phandle = <0x000000ab>;
        phandle = <0x000000ab>;
        allwinner,pins = "PD12", "PD13", "PD14", "PD15", "PD16", "PD17", "PD18", "PD19", "PD20",
"PD21";
        allwinner,function = "lcd0";
        allwinner,pname = "lcdd0", "lcdd1", "lcdd2", "lcdd3", "lcdd4", "lcdd5", "lcdd6", "lcdd7", "lcdd8",
"lcdd9";
        allwinner,muxsel = <0x00000003>;
        allwinner,pull = <0x00000000>;
        allwinner,drive = <0xffffffff>;
        allwinner,data = <0xffffffff>;
};
sunxi#
```

5.3.1.3. 查看 CPUS 的 PIN 配置

查看 s_uart0 的 PIN 配置

```
sunxi#fdt list /soc/pinctrl@01f02c00/s_uart0
s_uart0@0 {
        linux,phandle = <0x000000b4>;
        phandle = <0x000000b4>;
        allwinner,pins = "PL2", "PL3";
        allwinner,function = "s_uart0";
        allwinner,pname = "s_uart0_tx", "s_uart0_rx";
        allwinner,muxsel = <0x00000002>;
        allwinner,pull = <0xffffffff>;
        allwinner,drive = <0xffffffff>;
        allwinner,data = <0xffffffff>;
};
sunxi#
```

5.3.2. 修改 PIN 配置

使用 fdt set 命令可以修改 PIN 中相关属性字段

```
sunxi#fdt set /soc/pinctrl@01c20800/lcd0 allwinner,drive <0x1>
sunxi#fdt list /soc/pinctrl@01c20800/lcd0
lcd0@0 {
        linux,phandle = <0x000000ab>;
        phandle = <0x000000ab>;
```

```
        allwinner,pins = "PD12", "PD13", "PD14", "PD15", "PD16", "PD17", "PD18", "PD19", "PD20",
"PD21";
        allwinner,function = "lcd0";
        allwinner,pname = "lcdd0", "lcdd1", "lcdd2", "lcdd3", "lcdd4", "lcdd5", "lcdd6", "lcdd7", "lcdd8",
"lcdd9";
        allwinner,muxsel = <0x00000003>;
        allwinner,pull = <0x00000000>;
        allwinner,drive = <0x00000001>;
        allwinner,data = <0xffffffff>;
};
```

注意：示例中该处修改会影响 allwinner,pins 表示的所有端口的驱动能力配置，修改 muxsel pull data 的值也会产生类似效果。

5.4. GPIO 配置说明

5.4.1. Device tree 和 sysconfig.fex 中 GPIO 对应关系

以 usb 中 usb_id_gpio 为例

```
sunxi#fdt list /soc/usbc0
usbc0@0 {
        test = <0x00000002 0x00000003 0x12345678>;
        device_type = "usbc0";
        compatible = "allwinner,sun50i-otg-manager";
        ........
        usb_serial_unique = <0x00000000>;
        usb_serial_number = "20080411";
        rndis_wceis = <0x00000001>;
        status = "okay";
        usb_id_gpio = <0x00000030 0x00000007 0x00000009 0x00000000 0x00000001 0xffffffff
0xffffffff>;
};
```

```
usb_id_gpio             = port:PH09<0><1><default><default>
```

对应于 device tree 中

```
usb_id_gpio = <0x00000030 0x00000007 0x00000009 0x00000000 0x00000001 0xffffffff      0xffffffff>
```

由 5.1 节描述，　　端口 PH　　组内序号　功能分配　内部电阻状态　驱动能力　输出电平

其中首个 0x00000030 是 device tree 内部一个节点相关信息，这里可以略过。

5.4.2. 修改 GPIO 配置

如果需要修改 usb_id_gpio 的配置，可按如下方式（示例修改了驱动能力，输出电平两项）：

```
sunxi#fdt set /soc/usbc0 usb_id_gpio <0x00000030 0x00000007 0x00000009 0x00000000 0x00000001 0x2
0x1>
sunxi#fdt list
usbc0@0 {
        test = <0x00000002 0x00000003 0x12345678>;
        device_type = "usbc0";
        compatible = "allwinner,sun50i-otg-manager";
         ........
        usb_serial_unique = <0x00000000>;
        usb_serial_number = "20080411";
        rndis_wceis = <0x00000001>;
        status = "okay";
        usb_id_gpio = <0x00000030 0x00000007 0x00000009 0x00000000 0x00000001 0x00000002
0x00000001>;    //修改 ok
};
sunxi#
```

6. 保存配置

命令格式：fdt　save

作用：保存配置到存储介质上，掉电不会丢失。

运行该命令后，可以接着运行 reset 命令重启系统，然后用 fdt 查询命令看所修改的内容是否已永久生效。

说明：如果修改的内容只需要当次启动有效，则不需要运行该命令保存配置

7. 总结