2024.07.14-2024.07.20-work-log

工作进展

本阶段完成的任务是将RT-Thread的smart内核移植到树莓派4B上，并构建SD卡启动。然后测试当前项目编译出的Rust程序在树莓派上的运行情况。

编译固件

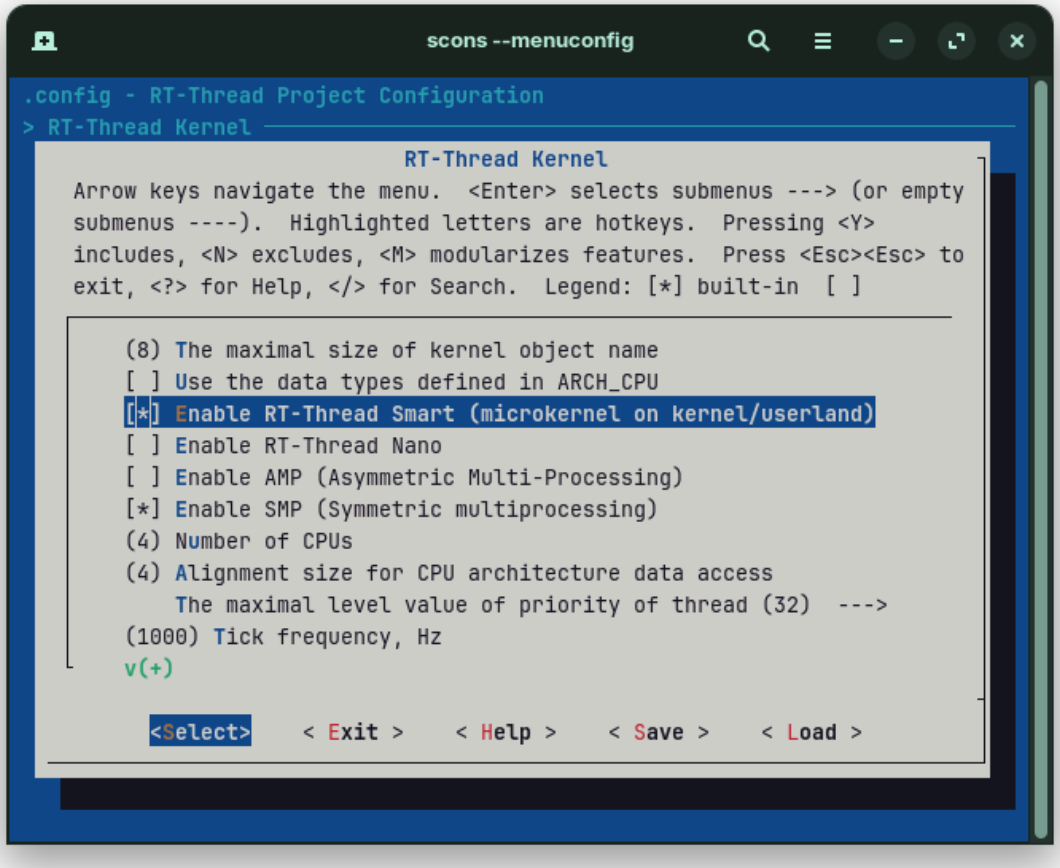
环境： linux amd64

下载rt-thread原码

在bsp\raspberry-pi\raspi4-64目录中运行配置

```
scons --menuconfig
```

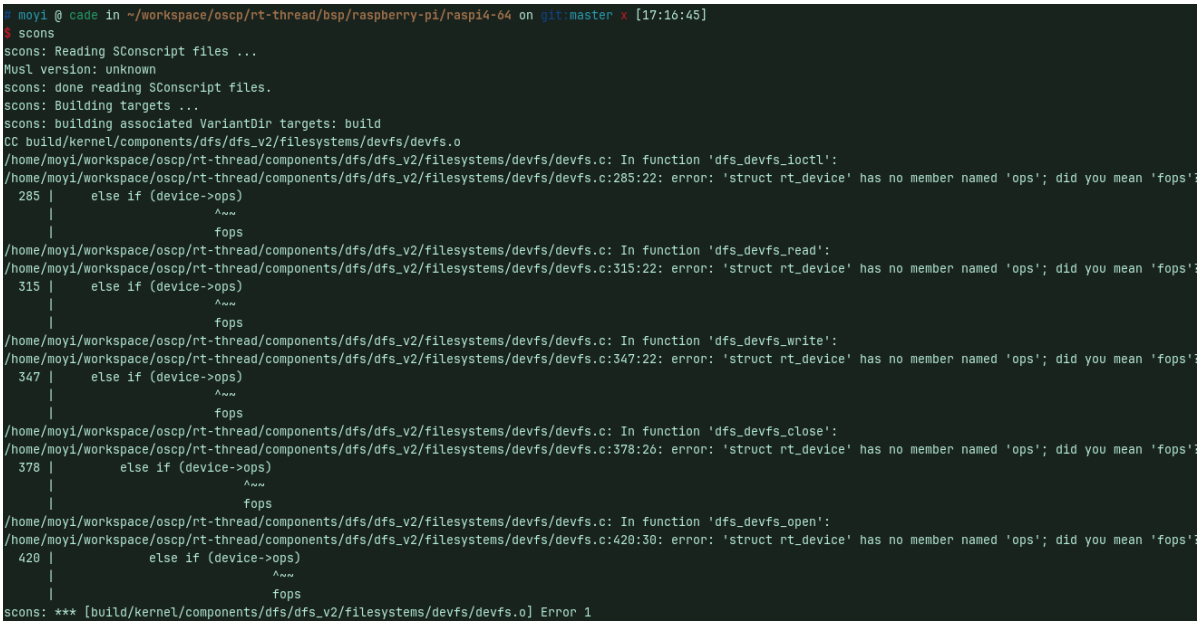
启用smart内核



保存设置后，编译固件

```
scons
```

报错



查询资料，根据issue可以对bsp进行修改

修改`rt-thread/components/dfs/dfs_v2/filesystems/devfs/devfs.c`285行，315行，347行，378行，420行的ops为fops后成功编译

构建SD卡

使用raspi-imager先刷入raspberry os 。然后，将/bsp/toosl/uboot.bin和config.txt放入sd卡的boot

上机

如下所示连接 USB 转 TTL 串口线:

Radxa SBC	连接	串口线
GND (pin 6)	<--->	黑色线
TX (pin 8)	<--->	白色线
RX (pin 10)	<--->	绿色线

使用tty转usb连线

```
U-Boot 2020.07-rc1-g627e7ce (May 11 2020 - 15:56:22 +0800)

DRAM:  3.9 GiB
RPI 4 Model B (0xd03115)
MMC:   mmcnr@7e300000: 1, mmc@7e340000: 0
Loading Environment from FAT... OK
In:    serial
Out:   serial
Err:   serial
Net:   eth0: ethernet@7d580000
Hit any key to stop autoboot:  0
ethernet@7d580000 Waiting for PHY auto negotiation to complete.... done
BOOTP broadcast 1
BOOTP broadcast 2
BOOTP broadcast 3
BOOTP broadcast 4
*** Unhandled DHCP Option in OFFER/ACK: 213
DHCP client bound to address 192.168.101.51 (1763 ms)
Using ethernet@7d580000 device
TFTP from server 192.168.101.6; our IP address is 192.168.101.51
Filename 'rtthread.bin'.
Load address: 0x208000
Loading: ##########################T ##########################T ################
         82 KiB/s
done
Bytes transferred = 933672 (e3f28 hex)
## Starting application at 0x00208000 ...
heap: 0x00154520 - 0x02000000

 \ | /
- RT -     Thread Smart Operating System
 / | \     5.1.0 build Jul 17 2024 17:26:48
 2006 - 2024 Copyright by RT-Thread team
lwIP-2.1.2 initialized!
EMMC: assuming clock rate to be 100MHz
[I/sal.skt] Socket Abstraction Layer initialize success.
[I/utest] utest is initialize success.
[I/utest] total utest testcase num: (0)
[I/DBG] version is B1

[I/SDIO] SD card capacity 500121600 KB.
found part[0], begin: 4194304, size: 512.0MB
found part[1], begin: 541065216, size: 5.164GB
file system initialization done!
cpu 1 boot success
Hi, this is RT-Thread!!
cpu 3 boot success
cpu 2 boot success
link disconnected
Support link mode Speed 1000M

msh />
```

问题

发现运行程序出现问题，判断为bsp配置问题，询问社区发现树莓派缺少社区支持

```
msh />./bin/he
msh />./bin/hello
msh />
exception info:
esr.EC :0x00
esr.IL :0x01
esr.ISS:0x00000000
epc    :0x0000000000400180
Exceptions with an unknow reason
Execption:
X00:0x0000ffff80000000 X01:0x0000000000400180 X02:0x0000ffff80000000 X03:0x0000ffff80000000
X04:0x0000000000000000 X05:0x0000000000400180 X06:0x0000000000000006 X07:0x0000000000000007
X08:0x0000000000000008 X09:0x0000000000000009 X10:0x000000000000000a X11:0x000000000000000b
X12:0x000000000000000c X13:0x000000000000000d X14:0x000000000000000e X15:0x000000000000000f
X16:0x0000000000000010 X17:0x0000000000000011 X18:0x0000000000000012 X19:0xffff000000030fd4
X20:0xffff0000000bfabc X21:0x0000000000000015 X22:0x0000000000000016 X23:0x0000000000000017
X24:0x0000000000000018 X25:0x0000000000000019 X26:0x000000000000001a X27:0x000000000000001b
X28:0x000000000000001c X29:0xffff000000247fb8 X30:0x0000000000000000
SP_EL0:0x0000ffff80000000
SPSR  :0x0000000000000000
EPC   :0x0000000000400180
[E/libcpu.trap] current thread: hello

thread   cpu bind pri  status      sp     stack size max used left tick   error  tcb addr
-------- --- ---- ---  ------- ---------- ----------  ------  ---------- ------- ------------------
hello      0   4   25  running 0x00000328 0x00004000     23%   0x000000c2 OK      0xffff000000180e00
tshell   N/A   4   20  suspend 0x000005f8 0x00002000     55%   0x0000000a OK      0xffff00000017aa00
console_ N/A   4   10  suspend 0x00000468 0x00001000     35%   0x00000008 OK      0xffff000000179a00
mmcsd_de N/A   4   22  suspend 0x00000438 0x00002000     25%   0x00000007 EINTRPT 0xffff000000122200
sys work N/A   4   23  suspend 0x000003b8 0x00002000     13%   0x0000000a OK      0xffff000000179800
tcpip    N/A   4   10  suspend 0x00000498 0x00004000     12%   0x00000013 EINTRPT 0xffff000000179600
etx      N/A   4   12  suspend 0x00000428 0x00004000     09%   0x0000000f EINTRPT 0xffff0000001106c0
erx      N/A   4   12  suspend 0x00000438 0x00004000     13%   0x0000000e EINTRPT 0xffff000000114960
pcache   N/A   4   25  suspend 0x00000488 0x00002000     14%   0x00000005 EINTRPT 0xffff000000179400
tsystem  N/A   4   30  suspend 0x00000408 0x00002000     16%   0x0000001f EINTRPT 0xffff00000012d790
tidle3     3   3   31  running 0x00000358 0x00002000     14%   0x00000020 OK      0xffff000000125590
tidle2     2   2   31  running 0x00000358 0x00002000     14%   0x0000001a OK      0xffff000000125390
tidle1     1   1   31  running 0x00000358 0x00002000     14%   0x0000000e OK      0xffff000000125190
tidle0   N/A   0   31  ready   0x00000358 0x00002000     18%   0x0000000a OK      0xffff000000124f90
timer    N/A   4    4  suspend 0x00000418 0x00002000     14%   0x00000009 EINTRPT 0xffff00000012fe68
user fault! pc = 0x400180
please use: addr2line -e ./bin/hello -a -f 0x400180 0xfffffffffffffffc
```

总结

本周主要工作是将RT-Thread的smart内核移植到树莓派4B上，并构建SD卡启动。然后测试当前项目编译出的Rust程序在树莓派上的运行情况。在移植过程中遇到了一些问题，通过查阅资料和询问社区解决了一部分问题，但是最终还是没有成功运行。原因是树莓派4B的支持不够完善，后续我们选择更换其他开发板进行测试。