

SPL Boot Time Optimizations on Jacinto SoCs



Gokul Praveen

This application brief provides the details of possible optimizations on TDA4x devices following SPL bootflow. Currently, on K3 architecture-based devices, the boot architecture is designed as follows:

R5 SPL -> ATF -> OPTEE -> A72 SPL -> U-BOOT -> Kernel

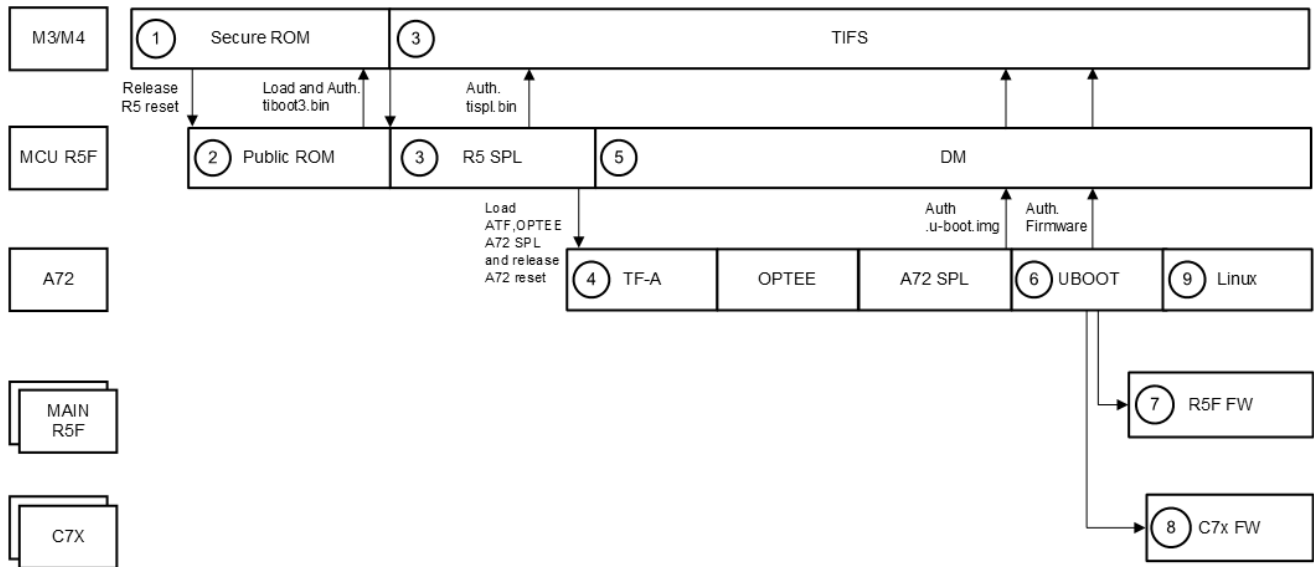


Figure 1. Normal Boot Flow

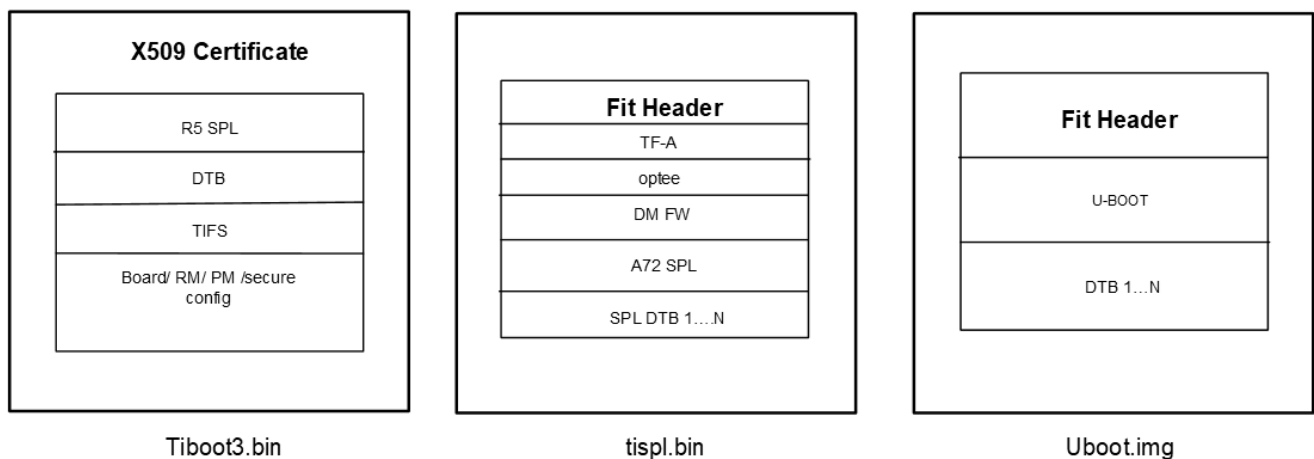


Figure 2. Image Format (Normal Boot Flow)

ROM supports boot only via MCU(R5). This means that the bootloader has to run on the R5 core. However, keeping faster boot time in mind, the semi-falcon boot mode or falcon boot mode can be utilized.

Semi-Falcon Boot Flow

Semi-Falcon Boot is used to significantly speed up embedded system startup by having the R5 Secondary Program Loader (R5 SPL) load the u-boot image to A core directly, bypassing the Axx Core Secondary Program Loader. This thus prevents the overhead caused by loading and executing the A Core Secondary Program Loader.

The semi falcon boot flow is as follows:

R5 SPL -> ATF -> OPTEE -> U-BOOT -> Kernel

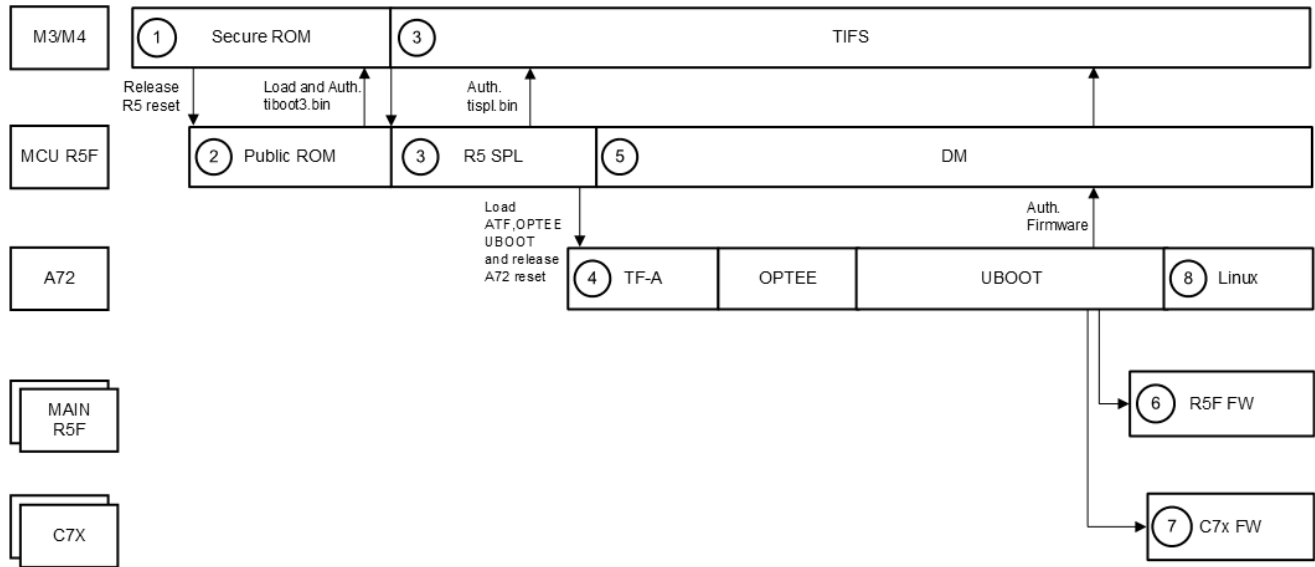


Figure 3. Semi-Falcon Boot Flow

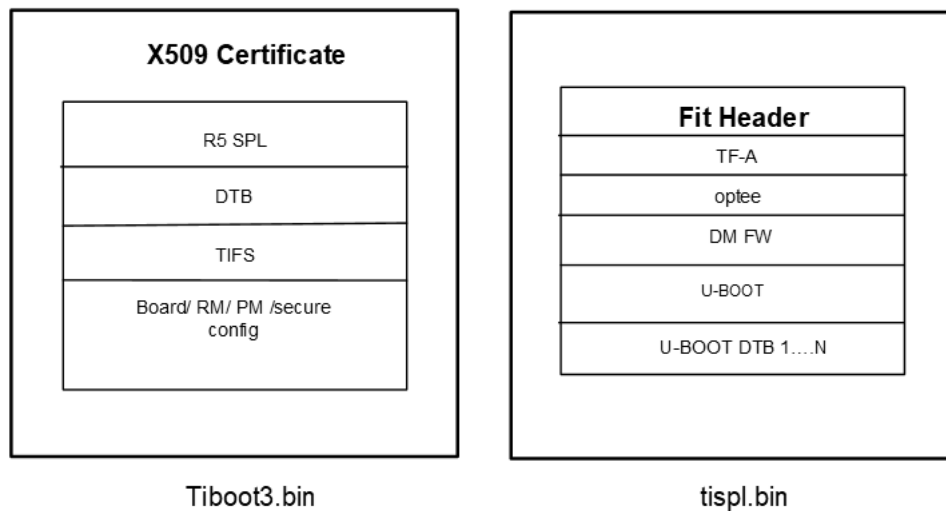


Figure 4. Image Format(Semi-Falcon Boot Flow)

Methodology

To enable semi falcon boot mode, the following steps were followed:

1. Removed SPL running on A core from the tispl.bin binary.
2. Packaged u-boot binary in the same location where A core SPL was present in the tispl.bin binary earlier.

3. Changed the config ('**CONFIG_TEXT_BASE**') present in 'A' core defconfig to point to the location where 'A' core SPL was loaded earlier.

'**CONFIG_TEXT_BASE**' corresponds to the location where U-BOOT is loaded in memory.

Performance improvement

- **SDK:** J784S4 LINUX SDK 11_00_00_08
- **Filesystem:** tisdk-adas-image-j784s4-evm.rootfs.tar.xz
- **Boot media :** SD CARD

Normal: 8.448ms(upto starting kernel ...print)

Semi-falcon : 8.176ms(upto starting kernel ...print)

FAQs

The following FAQ contains the patches required to enable this feature across Jacinto SoCs.

[\[FAQ\] DRA821: SPL BOOT without A72 SPL on J7200 on 10.1 SDK - Processors forum - Processors - TI E2E support forums](#)

Falcon Boot Flow

Falcon Boot is used to significantly speed up embedded system startup by having the Secondary Program Loader (SPL) load the kernel directly, bypassing the full U-Boot bootloader.

The falcon boot flow is as follows:

R5 SPL -> ATF -> OPTEE -> Kernel

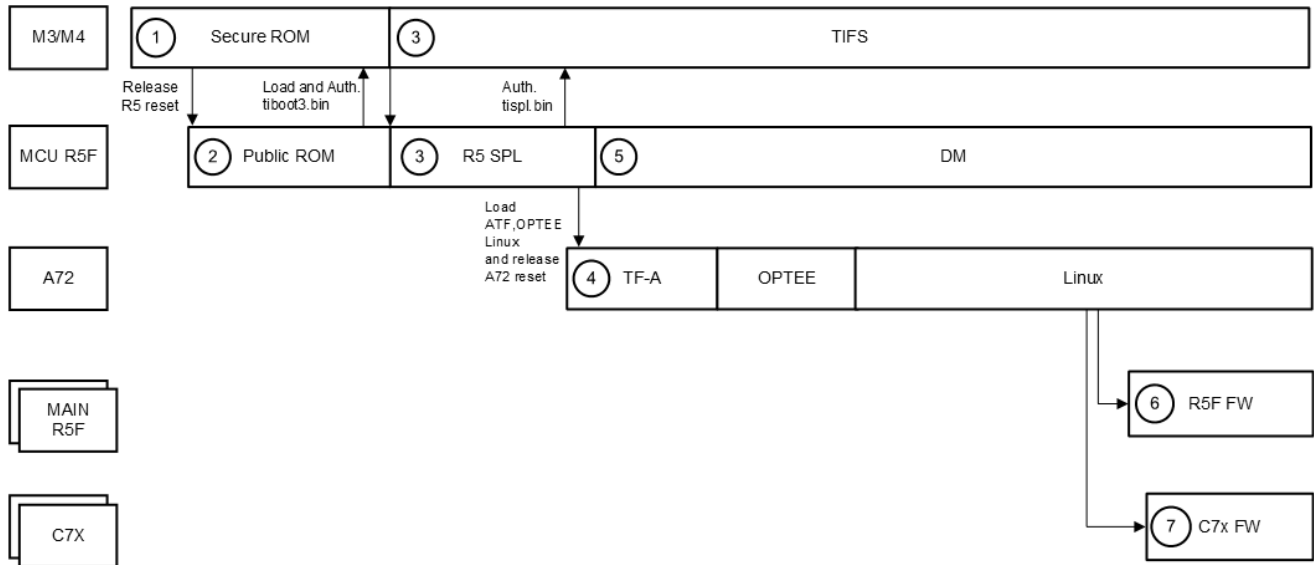


Figure 5. Falcon Boot Flow

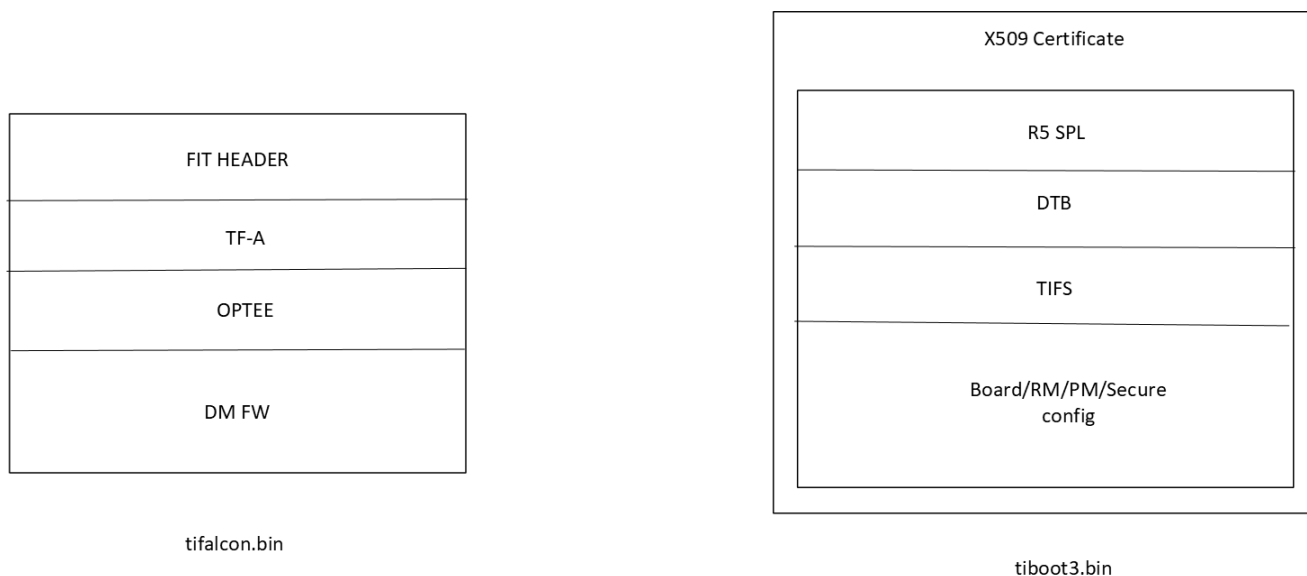


Figure 6. Image Format (Falcon Boot Flow)

Performance Improvement

- **SDK:** J784S4 LINUX SDK 11_02_00_02
- **Filesystem:** tisdk-adas-image-j784s4-evm.rootfs.tar.xz
- **Boot media :** SD CARD

Normal : 8.272 sec (upto starting kernel ...print)

Falcon : 2.7sec (upto Starting kernel ...print)

FAQ

The following FAQ contains the patches required to enable this feature across Jacinto SoCs.

[FAQ](#)

Trademarks

All trademarks are the property of their respective owners.

Trademarks

All trademarks are the property of their respective owners.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025