**1. Overview**

**1.1. Introduction**

A **Bootloader** is a program that runs when a device is powered on and is responsible for loading the OS or main application that runs the device. A general bootloader performs the following tasks:

1. Testing all essential storage and peripheral devices are working
2. Loading the operating system Kernel into memory
3. Executing the Kernel init process
4. Providing a way to change bootloader configuration

**1.2. System Definition**

The purpose of this project is to create a bootloader for a Linux based OS which runs on a product line of Smart Devices and appliances such as TVs, Tablets, Mobile Phones, Refrigerator Display, Microwave Display, Smart Speakers, Smart Monitors etc.

Below Figure 1 depicts the system boundary and how it will interact with outside components and actors:

1. A Boot ROM embedded in the smart device firmware will execute when the smart device is powered on by the user.
2. The primary actor on the system is the user of the device, but the user interacts with the bootloader through some peripheral or network input devices to provide input and interrupts or through the Boot ROM to power on the device
3. The bootloader developer is responsible for configuring the bootloader to interact with Boot ROM and Kernel.



Figure : System Definition

**User** refers to the end user of the device to be booted. User interacts with the system in the following ways:

1. Power on the system, which executes the code in Boot ROM to initialize bootloader
2. Provide Interrupt to the Bootloader to load shell.
3. Provider CLI Input to the bootloader to perform shell commands

**Boot ROM** refers to the code in the firmware of the device which are executed when it is powered on. The Boot ROM specifies a location where the bootloader must be stored. When it runs, it executes the bootloader from the predefined location. Bootloader developer is responsible for placing bootloader in the location specified by Boot ROM.

**I/O Device** is a peripheral or network I/O or Display device connected to the system which can be used to display the shell or by the user to provide inputs.

**Storage Device** is a storage location which can be a physical storage device connected to the smart device like Flash or SSD, a peripheral storage device like USB or a network storage device on a server. It holds the image of the kernel that is to be loaded by the bootloader.

**Memory** refers to the various types of RAM available to the system which it can utilize for its

operation.

**Kernel** refers to the entry point of the operating system or application that the bootloader needs to execute.

**1.3. Business Context**

The operating system which the bootloader loads is a Linux based OS runs on a diverse product line that includes TVs, Tablets, Mobile Phones, Refrigerator Display, Microwave Display, Smart Monitors etc.

These devices have varied capabilities in terms of onboard storage as well as having different peripherals such as displays and input devices based on their use case. For example, TVs have remote controllers as primary input and built in display but microwave will have on device buttons or voice command as input and no built in display. Therefore, our bootloader should be adaptable to all these environments present in various devices.

Regardless of the device, bootloader operations should be conducted in a way that the user does not have to wait long in order to use their device.

In addition it is essential for us to provide a way for the user to interact with the bootloader in case some configuration changes are needed.

It is also important for our business to ensure that our devices use the OS or applications we provide to ensure device integrity and prevent revenue loss from some other OS being used on our devices.

Based on the above context, we can extract the following key business drivers for our system:

* Fast boot time that is in line with or exceeds industry standards of each product in the product line.
* Easy to add support for new devices
* Bootloader should be easily update-able if needed
* The bootloader should ensure only valid OS images are loaded on the smart devices to prevent misuse