Herasmo Iniguez
1/25/2021

TEES 2020
Model 2070LX

The TEES 2020 includes specifications for a Linux based Model 2070 controller, the Model 2070LX. These specifications are an improvement from the original TEES 2009 2070LX specifications. The latest specifications facilitate binary portability and address various aspects of cybersecurity. The 2070LX controller consists of Model 2070-1C PowerPC based CPU Board capable of residing in the Model 2070E controller. This controller meets or exceeds the latest version of the ATC Standard.

1.0   **Hardware**

1.1   **CPU**
The Model 2070-1C CPU board contains an NXP series MPC 82xx / 83xx /85xx or QorIQ Processor with a minimum of 400 MIPS calculated using the Dhrystone v2.1 benchmark at 25°C. The CPU provides support for single or double-precision floating-point operations.

1.2   **Integrated Security Engine**
The Model 2070-IC CPU is required to have an integrated security engine which offloads the operation of encryption algorithms such AES. This makes the Model 2070-1C a high-performance data encryption and authentication system.

1.3   **RJ45 Network Jacks**
The Model 2070-1C provides three RJ45 Network ports in the face plate interfaced to the two independent switches. Two of these three port are connected to eth0 of the CPU. The third RJ45 Jack is connected to eth1 of the CPU which is also connected to the backplane (Motherboard) of the controller.

1.4   **Two Intergraded Network Switches**
This CPU in the Model 2070-1C contains two native network ports, eth0 and eth1. Each of the network ports is interfaced to 5-port network switch. This will allow for network segmentation within the controller and therefore providing network isolation between Caltrans and Local Agencies or applications for Connected Vehicles.

1.5   **Support for 3.3 Volt Datakeys**
Model 2070-IC works with Off-the-Shelf 3.3 VDC keys from Datakey and reads all keys up to 32 Mbits in size.

1.6   **Hardware Backwards compatibility**
The Model 2070-1C CPU Board plugs in into the lot where the Model 2070-1E lives and allows users to upgrade from OS-9 to Linux by simple replacing the CPU Board.

1.7 **USB Support**

In addition to the Datakey, the Model 2070-1C also provides a USB port meeting the USB 2.0 standard.

1.8 **SD Card Support**

The Model 2070-1C Provides support for Stand SD storage devices. This allows for local archiving capabilities with up to 4GByes of memory capacity.

1.9 **DRAM, FLASH and SRAM Memory**

The Model 2070-1C is required to have a minimum of 64 Mbytes of DRAM, 32 Mbytes of FLASH and 1Mbyte of SRAM. Some manufactures have double these storage capacities for example the Safetran's Model 2070-1C has 128Mbytes of DRAM.

2.0 **Software**

2.1 **Linux Kernel**

The Model 2070-1C is required to have Linux Kernel version 2.6.35 or later. By requiring version 2.6.35 or greater the operating system will be capable of supporting Real-Time Operating System services and functionality such OS Kernel Preemption and High-Resolution Timers.

2.2 **Linux Kernel Configuration**

The Model 2070-1C's Linux Kernel is configured with Real Time Operating System Features such as Kernel Preemption, Share Memory and High-Resolution Timers as well encryption capabilities.

2.3 **Standard glibc library**

The Model 2070-1C uses the GNU C Library (glibc) release v 2.23 or later. This version fixes cybersecurity vulnerabilities such the libraries' Stack-Based Buffer Overflow. This GNU C library also address binary portability by providing a set of standard libraries resident in every manufacturer's controller.

2.4 **Standardized Ver Module**

The Model 2070-1C Provides a "ver" utility that consists of Dynamically Linked "Shared Object" Library, libootid.so. The libootid.so library contains the controller identification including the TEES Version, Vendor Name and Image Built Date and can be read via the "ver" utility. This library also contains the ATC Std Version. The same information can be read programmable via a user program.

2.5 **Startup Procedure and Initialization**

The Model 2070-1C Linux System uses a scripted method for initialization compatible with SysVinit methods.   This allows standardization among all controller manufactures

and therefore facilitating binary portability.

2.6   Linux File System

The Model 2070-1C CPU Module Linux File System Configuration is required to meet the requirements and guidelines for files, directories, and utility commands as per the Filesystem Hierarchy Standard (FHS-3.0) dated March 15, 2015. The Linux Kernel shall be configured to use the Unsorted Block Image File System (UBIFS). This requirement addresses standardization as well a security and robustness. UBIFS was design to avoid file system correction as well as security.

2.7   SSL/SSH

The Model 2070-1C CPU contains OpenSSH 7.6 or later which consists of network utilities for establishing encrypted communications to and from the controller such as SFTP and SSH.