RPMMIO Kernel Module - Build and Distribution

This document contains details about building and distributing RPMMIO modules to support multiple kernel versions.

# Introduction

RPMMIO is a kernel module which does interaction with TPM module to update PCR 19 values from initrd image while host is booting.

RPMMIO being a kernel module it has very tight dependency on kernel version. Because of this RPMMIO module build against one kernel version doesn’t work with the other kernel version. This causes a limitation that CIT compute node can be installed on the host having same kernel version as of against which it was build. To support hosts with different kernel version multiple CIT compute node installers needs to be created which is difficult to manage.

# Solution

To solve this problem, RPMMIO could be built against multiple kernel versions to generate multiple binaries of RPMMIO (RPMMIO.ko). These RPMMIO.ko binaries could be included in CIT compute node installer. While installing CIT components on trusted host, depending on kernel version of the host appropriate RPMMIO.ko would be installed.

# How It Works

## Source code Changes

RPMMIO related code is now organized as separate module which could be packaged as independent installer.

All code related to RPMMIO is moved under “*dcg\_security-tboot-xm/rpmmio*” directory.

This directory contains,

* build-rpmmio.sh: This is a build script which builds RPMMIO code against all the available kernel headers on the build machine and generate “*rpmmio.ko*” binaries
* pom.xml: This is a Maven pom file which is responsible for calling build-rpmmio.sh script to generate binaries and packages all binaries in a zip file
* src/ : This directory contains source code of rpmmio kernel module

Code related to packaging RPMMIO as separate installer is available under “*dcg\_security-tboot-xm/packages/tbootxm-rpmmio-linux-makeself*” directory.

This directory contains,

* pom.xml: This Maven pom file is responsible for building (makeself) installer for RPMMIO module
* src/main/resources/setup.sh: This script is installation script for RPMMIO which is being executed while running installer and will install appropriate *rpmmio.ko* binary on host

## Build Process

**Prerequisite:** Build machine should have installed Kernel headers for all the kernel versions which CIT wants to support.

RPMMIO could be built and distributed as an independent installer or as part of the tboot-xm installer.

* In tboot-xm, Maven dependency for rpmmio module has been added, so build of tboot-xm triggers build of rpmmio package internally
* Rpmmio build process generates rpmmios for each kernel header available on the build machine
* It rename kernel modules as “rpmmio-<KERNEL-VERSION>.ko” and generates a zip bundle with all rpmmio.ko binaries
* Makeself script of rpmmio packages this zip file along with the installer script and creates an installer
* Tboot-xm installer packages this rpmmio makeself installer in its installer along with other artifacts

## Installation Process

RPMMIO could be installed as part of tboot-xm installation or later it could be used to install additional packages as well to support more kernel version.

Internals of installation process are as below:

* Tboot-xm installer contains rpmmio installer and is responsible to trigger install of rpmmio while installing tboot-xm
* RPMMIO installer extracts and copies all rpmmio-<KERNEL-VERSION>.ko files to *<TBOOT-XM-ROOT>/lib/rpmmios* directory
* RPMMIO installer checks for kernel version of the running host OS and copies that rpmmio.<HOST-KERNEL-VERSION>.ko file to *<TBOOT-XM-ROOT>/lib* directory which would be later used by tboot-xm installer to generate initrd
* If no matching rpmmio.ko file would be found in the installer, it will fail with appropriate message and installation would stop there