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usb-md (/p/usb-md/)

modified Linux USB driver kernel module

Status: Alpha **Brought to you by: ka_shrinivaasan (/u/userid-769929/)**

[r130] (/p/usb-md/code-0/130/): (./) / USBmd_notes.txt Restore (#) History (/p/usb-md/code-0/130/log/?path=/USBmd_notes.txt)

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485 lines (443 with data), 34.9 kB

```
#/****************************************************************************************
#* UMB - Universal Modified  Bus Driver - simple USB driver for debugging
#* This program is free software: you can redistribute it and/or modify
#* it under the terms of the GNU General Public License as published by
#* the Free Software Foundation, either version 3 of the License, or
#* (at your option) any later version.
#*
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#---------------------------------------------------------------------------------------------------
#*****************************************************************************************/

USBmd driver is an experimental modified version of already existing USB driver in linux.

Purpose of this modified version is for doing more sophisticated debugging of USB endpoints and devices and as
USB packet sniffer. Technical Necessity for this was created due to prolonged data theft, id spoofing and cybercrime th
in author's personal electronic devices for years that resulted in a Cybercrime Police Complaint also few years ago.

There were also such incidents while developing open source code (some code commits have description of these mysteriou

This is also done as a technical learning exercise to analyze USB Hosts, packets and USB's interaction,if any, with wir
mobiles, wireless LANs(radiotap) etc.,

In the longterm USBmd might have to be integrated into VIRGO. As VIRGO would would have the synergy of AstroInfer machi
codebase for "learning" from datasets, this USBmd driver can have the added ability of analyzing large USB traffic (as
using some decision making algorithms and evolve as an anti-cybercrime, anti-plagiarism and anti-theft tool to single o
"malevolent" traffic that would save individuals and organisations from the travails of tampering and loss of sensitive

The pattern mining of numeric dataset designed for AstroInfer can apply here also since USB bitstream can be analyzed u
numerical dataset mining. Also Discrete Fourier Transform used for analyzing data for frequencies (periodicities if any
USB data , for example USB wireless traffic.

=====================================================
new UMB driver bind - 27 Feb 2014 (for Bus id 7)
=====================================================
Following example commandlines install umb.ko module, unbind the existing option driver from bus-device id and bind the

sudo insmod umb.ko
echo -n "7-1:1.0" > /sys/bus/usb/drivers/option/unbind
echo -n "7-1:1.0" > /sys/bus/usb/drivers/umb/bind
```

```

======================================================
Commits as on 29 July 2014
======================================================
Driver has been ported and built on 3.15.5 kernel. Also a driver build script has been committed.

------------------------------------------------------
USBmd version 14.9.9 has been release tagged on 9 September 2014
------------------------------------------------------
------------------------------------------------------
USBmd version 15.1.8 has been release tagged on 8 January 2015
------------------------------------------------------

http://sourceforge.net/p/usb-md/code-0/HEAD/tree/Adding%20new%20vendor%20and%20product%20IDs%20to%20an%20existing%20USB

--------------------------------------------------------------------------------
USB debug messages from "cat /sys/kernel/debug/usb/devices" for UMB bound above:
--------------------------------------------------------------------------------

T:  Bus=07 Lev=01 Prnt=01 Port=00 Cnt=01 Dev#= 12 Spd=12   MxCh= 0
D:  Ver= 1.10 Cls=00(>ifc ) Sub=00 Prot=00 MxPS=64 #Cfgs=  1
P:  Vendor=12d1 ProdID=140b Rev= 0.00
S:  Manufacturer=HUA��WEI TECHNOLOGIES
S:  Product=HUAWEI Mobile
S:  SerialNumber=��������������������������������������
C:* #Ifs= 4 Cfg#= 1 Atr=a0 MxPwr=500mA
I:* If#= 0 Alt= 0 #EPs= 3 Cls=ff(vend.) Sub=ff Prot=ff Driver=umb
E:  Ad=81(I) Atr=03(Int.) MxPS=  16 Ivl=128ms
E:  Ad=82(I) Atr=02(Bulk) MxPS=  64 Ivl=0ms
E:  Ad=02(O) Atr=02(Bulk) MxPS=  64 Ivl=0ms
I:* If#= 1 Alt= 0 #EPs= 2 Cls=ff(vend.) Sub=ff Prot=ff Driver=option
E:  Ad=84(I) Atr=02(Bulk) MxPS=  64 Ivl=0ms
E:  Ad=04(O) Atr=02(Bulk) MxPS=  64 Ivl=0ms
I:* If#= 2 Alt= 0 #EPs= 2 Cls=ff(vend.) Sub=ff Prot=ff Driver=option
E:  Ad=86(I) Atr=02(Bulk) MxPS=  64 Ivl=0ms
E:  Ad=06(O) Atr=02(Bulk) MxPS=  64 Ivl=0ms
I:* If#= 3 Alt= 0 #EPs= 2 Cls=08(stor.) Sub=06 Prot=50 Driver=usb-storage
E:  Ad=87(I) Atr=02(Bulk) MxPS=  64 Ivl=0ms
E:  Ad=08(O) Atr=02(Bulk) MxPS=  64 Ivl=0ms

----------------------------------------------------------------------
usbmon, libpcap tcpdump and wireshark (or vusb-analyzer) debugging
----------------------------------------------------------------------
*mount ��-t debugfs none_debugs /sys/kernel/debug
*modprobe usbmon
*ls /sys/kernel/debug/usb/usbmon/

0s  0u  1s  1t  1u  2s  2t  2u  3s  3t  3u  4s  4t  4u  5s  5t  5u  6s  6t  6u  7s  7t  7u  8s  8t  8u

*cat /sys/kernel/debug/usb/usbmon/8t > usbmon.mon (any of the above usbmon debug logs)
*vusb-analyzer usbmon.mon

ef728540 3811287714 S Ci:001:00 s a3 00 0000 0001 0004 4 <
ef728540 3811287743 C Ci:001:00 0 4 = 00010000
ef728540 3811287752 S Ci:001:00 s a3 00 0000 0002 0004 4 <
ef728540 3811287763 C Ci:001:00 0 4 = 00010000
f50f6540 3811287770 S Ii:001:01 -115 2 <
f50f6540 3811287853 C Ii:001:01 -2 0
f5390540 3814543695 S Ci:001:00 s a3 00 0000 0001 0004 4 <
f5390540 3814543715 C Ci:001:00 0 4 = 00010000
f5390540 3814543756 S Ci:001:00 s a3 00 0000 0002 0004 4 <
f5390540 3814543767 C Ci:001:00 0 4 = 00010000
f50f6540 3814543805 S Ii:001:01 -115 2 <

*modprobe usbmon
*ls /dev/usbmon[1-8]
*tcpdump -i usbmon1 -w usbmon.pcap
tcpdump: listening on usbmon1, link-type USB_LINUX_MMAPPED (USB with padded Linux header), capture size 65535 bytes
^C86 packets captured
86 packets received by filter

*wireshark usbmon.pcap (loads on wireshark)

------------------------------------------------------------
Dynamic Debug - dev_dbg() and dev_vdbg()
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USB Debugging References:
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- Texas Instruments - http://elinux.org/images/1/17/USB_Debugging_and_Profiling_Techniques.pdf

```

```
--------------------------------------------------------
NeuronRain version 15.6.15 release tagged
--------------------------------------------------------

--------------------------------------------------------
Commits as on 11 July 2015
--------------------------------------------------------
usbmd kernel module has been ported to Linux Kernel 4.0.5

--------------------------------------------------------
Commits as on 26 November 2015
--------------------------------------------------------
- Updated USB-md driver with a lookup of VIRGO kernel_analytics config variable exported by kernel_analytics module in
- New header file umb.h has been added that externs the VIRGO kernel_analytics config array variables
- Module.symvers has been imported from VIRGO kernel_analytics and clean target has been commented in build script afte
- kern.log with umb_read() and umb_write() have been added with following commandlines:
      - cat /dev/umb0 - invokes umb_read() but there are kernel panics sometimes
      - cat <file> > /dev/umb0 - invokes umb_write()
  where umb0 is usb-md device name registered with /sys/bus/usb as below:
      - insmod umb.ko
      - echo -n "7-1:1.0" > /sys/bus/usb/drivers/option/unbind
      - echo -n "7-1:1.0" > /sys/bus/usb/drivers/umb/bind
- Updated build generated sources and object files have been added

---------------------------------------------------------
Commits as on 27 November 2015
---------------------------------------------------------
New folder usb_wwan_modified has been added that contains the USB serial, option and wireless USB modem WWAN drivers fr
instrumented with lot of printk()s so that log messages are written to kern.log. Though dev_dbg dynamic debugging can b
printk()s are sufficient for now. This traces through the USB connect and data transfer code:
        - probe
        - buffer is copied from userspace to kernelspace
        - URB is allocated in kernel
        - buffer is memcopied to URB
        - usb send/receive bulk pipe calls
        - usb_fill_bulk_urb
Almost all buffers like in and out buffers in URBs, portdata, interfacedata, serial_data, serial_port_data are printed
analyzable by AsFer machine learning code for USB debugging similar to usbmon logs.

These are initial commits only and usb-serial.c, usb_wwan.c, option.c and serial.h might be significantly altered going

---------------------------------------------------------
Commits as on 30 November 2015
---------------------------------------------------------
Added usb.h from kernel mainline, instrumented with printk() to print transfer_buffer in usb_fill_[control/bulk/interru

---------------------------------------------------------
Commits as on 1 December 2015
---------------------------------------------------------
- new kernel function print_buffer() has been added in usb.h that prints contents of char buffer in hex
- Above print_buffer() is invoked to print transfer_buffer in usb_wwan.c, usb-serial.c, option.c
- kern.log with print_buffer() output has been added - This dumps similar to wireshark, usbmon and other usb analyzers.

---------------------------------------------------------
Commits as on 2 December 2015
---------------------------------------------------------
- changed print_buffer() printk() to print a delimiter in each byte for AsFer Machine Learning code processing
- add a parser script for kern.log to print print_buffer() lines
- parsed kern.log with print_buffer() lines has been added
- Added an Apache Spark MapReduce python script to compute byte frequency in parsed print_buffer() kern.log

-----------------------------------------------------------------
(ONGOING) NeuronRain USBmd Debug and Malafide Traffic Analytics
-----------------------------------------------------------------
As mentioned in commit notes above, USB incoming and outgoing data transfer_buffer are dumped byte-by-byte. Given this
analytics can be performed most of which are already implemented in AsFer codebase:
- frequency of bytes
- most frequent sequence of bytes
- bayesian and decision tree inference
- deep learning
- perceptrons
- streaming algorithms for USB data stream
and so on.

-----------------------------------------------------------------
Commits as on 3 December 2015
-----------------------------------------------------------------
- Apache Spark script for analyzing the USBWWAN byte stream logs has been updated with byte counts map-reduce functions
and temp DataFrame Table creation with SparkSQL.
- logs for the script have been added in usb_wwan_modified/python-src/testlogs/Spark_USBWWANLogMapReduceParser.out.3Dec
- kern.log parser shellscript has been updated
```

```

-------------------------------------------------------------------
AsFer commits for USBmd as on 4 December 2015
-------------------------------------------------------------------
All the Streaming_<>.py Streaming Algorithm implementations in AsFer/python-src/ have been updated with:
- hashlib ripemd160 hash MD algorithm for hash functions and return hexdigest()
- USBWWAN byte stream data from USBmd print_buffer() logs in usb-md/usb_wwan_modified/testlogs/ has been added as a Data
- logs for the above have been added to asfer/python-src/testlogs/
- Streaming Abstract Generator has been updated with USB stream data iterable and parametrized for data source and stor
- Some corrections to the asfer/python-src/Streaming_<> scripts

-------------------------------------------------------------------
Commits as on 7 December 2015
-------------------------------------------------------------------
- added Spark Mapreduce and DataFrame log for USBWWAN byte stream
- added a parsed kern.log with only bytes from USBWWAN stream
- Added dict() and sort() for query results and printed cardinality of the stream data set which is the size of the dic
An example log has been added which prints the cardinality as ~250. In contrast, LogLog and HyperLogLog counter estimat
approximate the cardinality to 140 and 110 respectively

----------------------------------------------------------------------------------------
AsFer commits for USBmd as on 11 December 2015 - USBWWAN stream data backend in MongoDB
----------------------------------------------------------------------------------------
 Dependency Injection code commits for MongoDB backend - With this MongoDB is also a storage backend for AsFer algorith
- Abstract_DBBackend.py has been updated for both MySQL and MongoDB injections
- MongoDB configuration and backend connect/query code has been added. Backend is either populated by Robomongo or pymo
Streaming Abstract Generator iterable framework.
- With this AsFer supports both SQL(MySQL) and NoSQL(file,hive,hbase,cassandra backends in Streaming Abstract Generator
- log with a simple NoSQL table with StreamingData.txt and USBWWAN data has been added to testlogs/.
- MongoDB configuration has a database(asfer-database) and a collection(asfer-collection).
- MongoDB_DBBackend @provides pymongo.collection.Collection which is @inject-ed to Abstract_DBBackend

----------------------------------------------------------------------------------------
Commits as on 10 January 2016
----------------------------------------------------------------------------------------
NeuronRain USBmd research version 2016.1.10 released.

----------------------------------------------------------------------------------------
Commits - 4 August 2016
----------------------------------------------------------------------------------------
1.New build script for drivers/usb top level folder has been added.
2.Copyleft notices updated
3.print_buffer() in usb.h has been #ifdef-ed based on a build time flag to suppress the buffer bytes dump preferentiall
kern.log is not flooded.
4.Flag PRINT_BUFFER has to be defined with #define somewhere within KBuild makefiles or externally.
5..ko files rebuilt
6. Miscellaneous code changes to suppress kbuild warnings - cast etc.,
7. PRINT_BUFFER block changed to print the bytes in single line for each buffer

-----------------------------------------------------------------------------------------------------------------
Commits - 13 July 2017 - usb-storage driver last sector access slab out of bounds error in 64-bit - committed for analy
- this error was frequently witnessed in VIRGO 32-bit stability issues and panics - ISRA looks like a GCC
optimization of a function invocation (Interprocedural Scalar Replacement of Aggregates)
-----------------------------------------------------------------------------------------------------------------
Jul 13 15:03:36 localhost kernel: [ 9837.497280] ==================================================================
Jul 13 15:03:36 localhost kernel: [ 9837.499787] ==================================================================
Jul 13 15:03:36 localhost kernel: [ 9837.499822] BUG: KASAN: slab-out-of-bounds in last_sector_hacks.isra.1.part.2+0xc9
Jul 13 15:03:36 localhost kernel: [ 9837.499831] Read of size 8 by task usb-storage/6243
Jul 13 15:03:36 localhost kernel: [ 9837.499844] CPU: 0 PID: 6243 Comm: usb-storage Tainted: G    B           4.10.3 #1
Jul 13 15:03:36 localhost kernel: [ 9837.499849] Hardware name: Dell Inc. Inspiron 1545                   /0J037P, BIOS
Jul 13 15:03:36 localhost kernel: [ 9837.499851] Call Trace:
Jul 13 15:03:36 localhost kernel: [ 9837.499863]  dump_stack+0x63/0x8b
Jul 13 15:03:36 localhost kernel: [ 9837.499870]  kasan_object_err+0x21/0x70
Jul 13 15:03:36 localhost kernel: [ 9837.499877]  kasan_report.part.1+0x219/0x4f0
Jul 13 15:03:36 localhost kernel: [ 9837.499893]  ? last_sector_hacks.isra.1.part.2+0xc9/0x1d0 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.499899]  kasan_report+0x25/0x30
Jul 13 15:03:36 localhost kernel: [ 9837.499906]  __asan_load8+0x5e/0x70
Jul 13 15:03:36 localhost kernel: [ 9837.499922]  last_sector_hacks.isra.1.part.2+0xc9/0x1d0 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.499938]  usb_stor_invoke_transport+0x1a1/0x960 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.499946]  ? migrate_swap_stop+0x2e0/0x2e0
Jul 13 15:03:36 localhost kernel: [ 9837.499963]  ? usb_stor_port_reset+0xb0/0xb0 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.499973]  ? wait_for_completion_interruptible+0x1a7/0x260
Jul 13 15:03:36 localhost kernel: [ 9837.499981]  ? wait_for_completion_killable+0x2a0/0x2a0
Jul 13 15:03:36 localhost kernel: [ 9837.499989]  ? raise_softirq_irqoff+0xba/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.499995]  ? wake_up_q+0x80/0x80
Jul 13 15:03:36 localhost kernel: [ 9837.500011]  usb_stor_transparent_scsi_command+0xe/0x10 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  usb_stor_control_thread+0x344/0x510 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ? usb_stor_disconnect+0x120/0x120 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ? default_wake_function+0x2f/0x40
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ? __wake_up_common+0x78/0xc0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kthread+0x178/0x1d0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ? usb_stor_disconnect+0x120/0x120 [usb_storage]
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ? kthread_create_on_node+0xd0/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ret_from_fork+0x2c/0x40
Jul 13 15:03:36 localhost kernel: [ 9837.500017] Object at ffff88007cdaa668, in cache kmalloc-192 size: 192
Jul 13 15:03:36 localhost kernel: [ 9837.500017] Allocated:
Jul 13 15:03:36 localhost kernel: [ 9837.500017] PID = 6277
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  save_stack_trace+0x1b/0x20
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  save_stack+0x46/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kasan_kmalloc+0xad/0xe0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kmem_cache_alloc_trace+0xef/0x210
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kernfs_fop_open+0x14b/0x540
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  do_dentry_open+0x39a/0x560
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  vfs_open+0x84/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  path_openat+0x4ab/0x1e10
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  do_filp_open+0x122/0x1c0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  do_sys_open+0x17c/0x2c0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  compat_SyS_open+0x1b/0x20
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  do_fast_syscall_32+0x188/0x300
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  entry_SYSENTER_compat+0x4c/0x5b
Jul 13 15:03:36 localhost kernel: [ 9837.500017] Freed:
Jul 13 15:03:36 localhost kernel: [ 9837.500017] PID = 6277
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  save_stack_trace+0x1b/0x20
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  save_stack+0x46/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kasan_slab_free+0x71/0xb0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kfree+0x9e/0x1e0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  kernfs_fop_release+0x87/0xa0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  __fput+0x177/0x350
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ____fput+0xe/0x10
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  task_work_run+0xa0/0xc0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  exit_to_usermode_loop+0xc5/0xd0
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  do_fast_syscall_32+0x2ef/0x300
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  entry_SYSENTER_compat+0x4c/0x5b
Jul 13 15:03:36 localhost kernel: [ 9837.500017] Memory state around the buggy address:
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ffff88007cdaa600: fc fc fc fc fc fc fc fc fc fc fc fc fc fb fb fb
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ffff88007cdaa680: fb fb fb fb fb fb fb fb fb fb fb fb fb fb fb fb
Jul 13 15:03:36 localhost kernel: [ 9837.500017] >ffff88007cdaa700: fb fb fb fb fb fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:36 localhost kernel: [ 9837.500017]                                                     ^
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ffff88007cdaa780: fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:36 localhost kernel: [ 9837.500017]  ffff88007cdaa800: fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:36 localhost kernel: [ 9837.500017] ==================================================================
Jul 13 15:03:37 localhost kernel: [ 9837.668157] ==================================================================
Jul 13 15:03:37 localhost kernel: [ 9837.668191] BUG: KASAN: slab-out-of-bounds in last_sector_hacks.isra.1.part.2+0xc9
Jul 13 15:03:37 localhost kernel: [ 9837.668200] Read of size 8 by task usb-storage/6243
Jul 13 15:03:37 localhost kernel: [ 9837.668213] CPU: 1 PID: 6243 Comm: usb-storage Tainted: G          B          4.10.3 #1
Jul 13 15:03:37 localhost kernel: [ 9837.668218] Hardware name: Dell Inc. Inspiron 1545                   /0J037P, BIOS
Jul 13 15:03:37 localhost kernel: [ 9837.668220] Call Trace:
Jul 13 15:03:37 localhost kernel: [ 9837.668233]  dump_stack+0x63/0x8b
Jul 13 15:03:37 localhost kernel: [ 9837.668240]  kasan_object_err+0x21/0x70
Jul 13 15:03:37 localhost kernel: [ 9837.668247]  kasan_report.part.1+0x219/0x4f0
Jul 13 15:03:37 localhost kernel: [ 9837.668263]  ? last_sector_hacks.isra.1.part.2+0xc9/0x1d0 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668269]  kasan_report+0x25/0x30
Jul 13 15:03:37 localhost kernel: [ 9837.668277]  __asan_load8+0x5e/0x70
Jul 13 15:03:37 localhost kernel: [ 9837.668292]  last_sector_hacks.isra.1.part.2+0xc9/0x1d0 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668308]  usb_stor_invoke_transport+0x1a1/0x960 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668316]  ? migrate_swap_stop+0x2e0/0x2e0
Jul 13 15:03:37 localhost kernel: [ 9837.668332]  ? usb_stor_port_reset+0xb0/0xb0 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668343]  ? wait_for_completion_interruptible+0x1a7/0x260
Jul 13 15:03:37 localhost kernel: [ 9837.668351]  ? wait_for_completion_killable+0x2a0/0x2a0
Jul 13 15:03:37 localhost kernel: [ 9837.668360]  ? raise_softirq_irqoff+0xba/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668366]  ? wake_up_q+0x80/0x80
Jul 13 15:03:37 localhost kernel: [ 9837.668382]  usb_stor_transparent_scsi_command+0xe/0x10 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668398]  usb_stor_control_thread+0x344/0x510 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668415]  ? usb_stor_disconnect+0x120/0x120 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668422]  ? default_wake_function+0x2f/0x40
Jul 13 15:03:37 localhost kernel: [ 9837.668430]  ? __wake_up_common+0x78/0xc0
Jul 13 15:03:37 localhost kernel: [ 9837.668436]  kthread+0x178/0x1d0
Jul 13 15:03:37 localhost kernel: [ 9837.668454]  ? usb_stor_disconnect+0x120/0x120 [usb_storage]
Jul 13 15:03:37 localhost kernel: [ 9837.668460]  ? kthread_create_on_node+0xd0/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668466]  ret_from_fork+0x2c/0x40
Jul 13 15:03:37 localhost kernel: [ 9837.668472] Object at ffff88007cdaa668, in cache kmalloc-192 size: 192
Jul 13 15:03:37 localhost kernel: [ 9837.668478] Allocated:
Jul 13 15:03:37 localhost kernel: [ 9837.668483] PID = 6277
Jul 13 15:03:37 localhost kernel: [ 9837.668494]  save_stack_trace+0x1b/0x20
Jul 13 15:03:37 localhost kernel: [ 9837.668500]  save_stack+0x46/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668506]  kasan_kmalloc+0xad/0xe0
Jul 13 15:03:37 localhost kernel: [ 9837.668513]  kmem_cache_alloc_trace+0xef/0x210
Jul 13 15:03:37 localhost kernel: [ 9837.668520]  kernfs_fop_open+0x14b/0x540
Jul 13 15:03:37 localhost kernel: [ 9837.668527]  do_dentry_open+0x39a/0x560
Jul 13 15:03:37 localhost kernel: [ 9837.668532]  vfs_open+0x84/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668538]  path_openat+0x4ab/0x1e10
Jul 13 15:03:37 localhost kernel: [ 9837.668544]  do_filp_open+0x122/0x1c0
Jul 13 15:03:37 localhost kernel: [ 9837.668549]  do_sys_open+0x17c/0x2c0
Jul 13 15:03:37 localhost kernel: [ 9837.668554]  compat_SyS_open+0x1b/0x20
Jul 13 15:03:37 localhost kernel: [ 9837.668561]  do_fast_syscall_32+0x188/0x300
Jul 13 15:03:37 localhost kernel: [ 9837.668568]  entry_SYSENTER_compat+0x4c/0x5b
Jul 13 15:03:37 localhost kernel: [ 9837.668570] Freed:
Jul 13 15:03:37 localhost kernel: [ 9837.668575] PID = 6277
Jul 13 15:03:37 localhost kernel: [ 9837.668583]  save_stack_trace+0x1b/0x20
Jul 13 15:03:37 localhost kernel: [ 9837.668589]  save_stack+0x46/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668594]  kasan_slab_free+0x71/0xb0
Jul 13 15:03:37 localhost kernel: [ 9837.668599]  kfree+0x9e/0x1e0
Jul 13 15:03:37 localhost kernel: [ 9837.668605]  kernfs_fop_release+0x87/0xa0
Jul 13 15:03:37 localhost kernel: [ 9837.668611]  __fput+0x177/0x350
Jul 13 15:03:37 localhost kernel: [ 9837.668616]  ____fput+0xe/0x10
Jul 13 15:03:37 localhost kernel: [ 9837.668623]  task_work_run+0xa0/0xc0
Jul 13 15:03:37 localhost kernel: [ 9837.668629]  exit_to_usermode_loop+0xc5/0xd0
Jul 13 15:03:37 localhost kernel: [ 9837.668635]  do_fast_syscall_32+0x2ef/0x300
Jul 13 15:03:37 localhost kernel: [ 9837.668642]  entry_SYSENTER_compat+0x4c/0x5b
Jul 13 15:03:37 localhost kernel: [ 9837.668644] Memory state around the buggy address:
Jul 13 15:03:37 localhost kernel: [ 9837.668655]  ffff88007cdaa600: fc fc fc fc fc fc fc fc fc fc fc fc fc fb fb fb
Jul 13 15:03:37 localhost kernel: [ 9837.668664]  ffff88007cdaa680: fb fb fb fb fb fb fb fb fb fb fb fb fb fb fb fb
Jul 13 15:03:37 localhost kernel: [ 9837.668674] >ffff88007cdaa700: fb fb fb fb fb fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:37 localhost kernel: [ 9837.668680]                                                     ^
Jul 13 15:03:37 localhost kernel: [ 9837.668689]  ffff88007cdaa780: fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:37 localhost kernel: [ 9837.668698]  ffff88007cdaa800: fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc fc
Jul 13 15:03:37 localhost kernel: [ 9837.668704] ==================================================================
Jul 13 15:03:37 localhost NetworkManager[745]: <info>  [1499938417.1889]   address 192.168.1.100

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Commits - 13 August 2017 - Suspicious use-after-free error flagged by Kernel Address Sanitizer - committed for analysis
This error precedes last_sector_hacks ISRA error above in USB storage driver.
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Aug 13 14:53:17 localhost kernel: [   47.797146] BUG: KASAN: use-after-free in sr_probe+0x7e0/0xb20 at addr ffff8800000
Aug 13 14:53:17 localhost kernel: [   47.797146] Read of size 1 by task kworker/u4:1/37
Aug 13 14:53:17 localhost kernel: [   47.797146] page:ffffea0000002580 count:0 mapcount:0 mapping:          (null) inde
Aug 13 14:53:17 localhost kernel: [   47.797146] flags: 0x0()
Aug 13 14:53:17 localhost kernel: [   47.797146] raw: 0000000000000000 0000000000000000 0000000000000000 00000000ffffff
Aug 13 14:53:17 localhost kernel: [   47.797146] raw: ffffea00000025a0 ffffea00000025a0 0000000000000000 00000000000000
Aug 13 14:53:17 localhost kernel: [   47.797146] page dumped because: kasan: bad access detected
Aug 13 14:53:17 localhost kernel: [   47.797146] CPU: 1 PID: 37 Comm: kworker/u4:1 Tainted: G    B           4.10.3 #18
Aug 13 14:53:17 localhost kernel: [   47.797146] Hardware name: Dell Inc. Inspiron 1545                   /0J037P, BIOS
Aug 13 14:53:17 localhost kernel: [   47.797146] Workqueue: events_unbound async_run_entry_fn
Aug 13 14:53:17 localhost kernel: [   47.797146] Call Trace:
Aug 13 14:53:17 localhost kernel: [   47.797146]  dump_stack+0x63/0x8b
Aug 13 14:53:17 localhost kernel: [   47.797146]  kasan_report.part.1+0x4bc/0x4f0
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? sr_probe+0x7e0/0xb20
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? scsi_mode_select+0x370/0x370
Aug 13 14:53:17 localhost kernel: [   47.797146]  kasan_report+0x25/0x30
Aug 13 14:53:17 localhost kernel: [   47.797146]  __asan_load1+0x47/0x50
Aug 13 14:53:17 localhost kernel: [   47.797146]  sr_probe+0x7e0/0xb20
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? kernfs_next_descendant_post+0x93/0xf0
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? sr_block_ioctl+0xe0/0xe0
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? sysfs_do_create_link_sd.isra.2+0x7c/0xc0
Aug 13 14:53:17 localhost kernel: [   47.797146]  driver_probe_device+0x40b/0x670
Aug 13 14:53:17 localhost kernel: [   47.797146]  __device_attach_driver+0xd9/0x160
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? __driver_attach+0x120/0x120
Aug 13 14:53:17 localhost kernel: [   47.797146]  bus_for_each_drv+0x107/0x180
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? bus_rescan_devices+0x20/0x20
Aug 13 14:53:17 localhost kernel: [   47.797146]  __device_attach+0x17e/0x200
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? device_bind_driver+0x80/0x80
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? kobject_uevent_env+0x1ec/0x7f0
Aug 13 14:53:17 localhost kernel: [   47.797146]  device_initial_probe+0x13/0x20
Aug 13 14:53:17 localhost kernel: [   47.797146]  bus_probe_device+0xfe/0x120
Aug 13 14:53:17 localhost kernel: [   47.797146]  device_add+0x5f1/0x9f0
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? device_private_init+0xc0/0xc0
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? scsi_dh_add_device+0xd4/0x130
Aug 13 14:53:17 localhost kernel: [   47.797146]  scsi_sysfs_add_sdev+0xd1/0x350
Aug 13 14:53:17 localhost kernel: [   47.797146]  do_scan_async+0xfd/0x230
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? scsi_scan_host+0x250/0x250
Aug 13 14:53:17 localhost kernel: [   47.797146]  async_run_entry_fn+0x84/0x270
Aug 13 14:53:17 localhost kernel: [   47.797146]  ? pwq_dec_nr_in_flight+0x8c/0x110
Aug 13 14:53:17 localhost kernel: [   47.797146]  process_one_work+0x2c6/0x7d0
Aug 13 14:53:17 localhost kernel: [   47.797146]  worker_thread+0x90/0x850
Aug 13 14:53:17 localhost kernel: [   47.797146]  kthread+0x178/0x1d0

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(FEATURE-DONE) Spark Cloud Analytics for Linux Kernel 4.10.3 64 bit with Kernel Address Sanitizer debug logging enabled
- Commits 1
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(*) Upgraded Spark version to 2.1.0 on Hadoop 2.7
(*) Changed to SparkContext text file instead of reading the input kernel log in python I/O
(*) Added flatMap to front of MapReduce chain of transformations for tokenizer
(*) Changed the input kernel log to 64bit 4.10.3 Kernel Address Sanitizer enabled kern.log which prints lot of debuggin
memory accesses especially for USBWWAN and USB Storage drivers.
(*) This is an alternative to traditional promiscuous USB Analyzers like WireShark to get kernel stack traces for USB a
(*) Particularly useful in malware related untoward memory access and traffic analysis
(*) Unifies Kernel Address Sanitizer, USB storage/WLAN driver and Spark Cloud for analytics
(*) Logs for this have been committed to testlogs/ and python-src/testlogs

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(FEATURE-DONE) Spark Cloud Analytics for Linux Kernel 4.10.3 64 bit with Kernel Address Sanitizer debug logging enabled
- Commits 2
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(*) Added a substring match filter to RDD map/reduce transformations chain
(*) Presently hardcoded as "+0x" which extracts all kernel functions invoked from Kernel Address Sanitizer kern.log and

Previous profiling prints following top kernel function invocations:
(u'last_sector_hacks.isra.1.part.2+0xc9/0x1d0', 159),
 (u'usb_stor_disconnect+0x120/0x120', 106),
 (u'save_stack+0x46/0xd0', 106),
 (u'save_stack_trace+0x1b/0x20', 106),
 (u'entry_SYSENTER_compat+0x4c/0x5b', 85),
 (u'kthread+0x178/0x1d0', 74),
implying heavy dependence on last_sector_hacks.isra gcc optimization. Discussion on https://groups.google.com/forum/#!t
```