26.3.2024.

Socket iz config jsona ce stvorit docker daemon

- https://docs.docker.com/engine/extend/config/#config-field-descriptions
  - bit ce stvoren u /run/docker/plugins pa onda:

```
func main() {
	d := driver.Driver{}
	h := network.NewHandler(&d)
	u, err := user.Current()

	if err != nil {
		panic(err)
	}

	gid, err := strconv.Atoi(u.Gid)

	if err != nil {
		panic(err)
	}

	h.ServeUnix("/run/docker/plugins/dockercan.sock", gid)
}
```

Ali moze i ovako:

```
func main() {
	d := driver.Driver{}
	h := network.NewHandler(&d)

	h.ServeTCP("dockercan", "127.0.0.1:1337",
sdk.WindowsDefaultDaemonRootDir(), nil)
}
```

funkcija servetcp automatski ce stvorit .spec file u direktoriju u kojem ce ga docker daemon prepoznat

Odnosno prilagodjeno:

```go
func main() {
	d := driver.Driver{}
	h := network.NewHandler(&d)

	log.Println("Starting CAN docker network driver at 127.0.0.1:1337")
	err := h.ServeTCP("dockercan", "127.0.0.1:1337", "", nil)

	if err != nil {
		log.Panicln(err)
	}
}
```

Pokretanje bez sudo rezultira u gresci zbog nedostatka prava za stvaranje direktorija u /etc Nakon sudo:

```
❯ sudo ./bin/netplugin
[sudo] password for lgm:
2024/03/27 01:03:49 Starting CAN docker network driver at 127.0.0.1:1337
```

```
❯ ls /etc/docker/plugins
dockercan.spec
❯ cat /etc/docker/plugins/dockercan.spec
tcp://127.0.0.1:1337
```

Specificnosti:

- pokretanje ServeTCP s drugim portom azurira spec file
- gasenje s ctrl c ne brise spec file

27.3.2024.

/NetworkPlugin.Join

Na /NetworkPlugin.Join poziv, dogadja se:

The entries in `InterfaceName` represent actual OS level interfaces that should be moved by LibNetwork into the sandbox; the `SrcName` is the name of the OS level interface that the remote process created, and the `DstPrefix` is a prefix for the name the OS level interface should have after it has been moved into the sandbox (LibNetwork will append an index to make sure the actual name does not collide with others).

Znaci vec jedan kraj vec stvorenog para sucelja treba premaknuti u skriveni ns naseg drivera, a drugi ce premaknuti libnetwork u container:

```
sudo ip link add testif type vxcan peer name testifp
sudo ip link set dev testif up
sudo ip link set dev testifp up
sudo ip link set testifp netns test
```

I onda s cangw-om ga povezati (primjerice na vcan0), ali iz default namespacea u kojem radi driver:

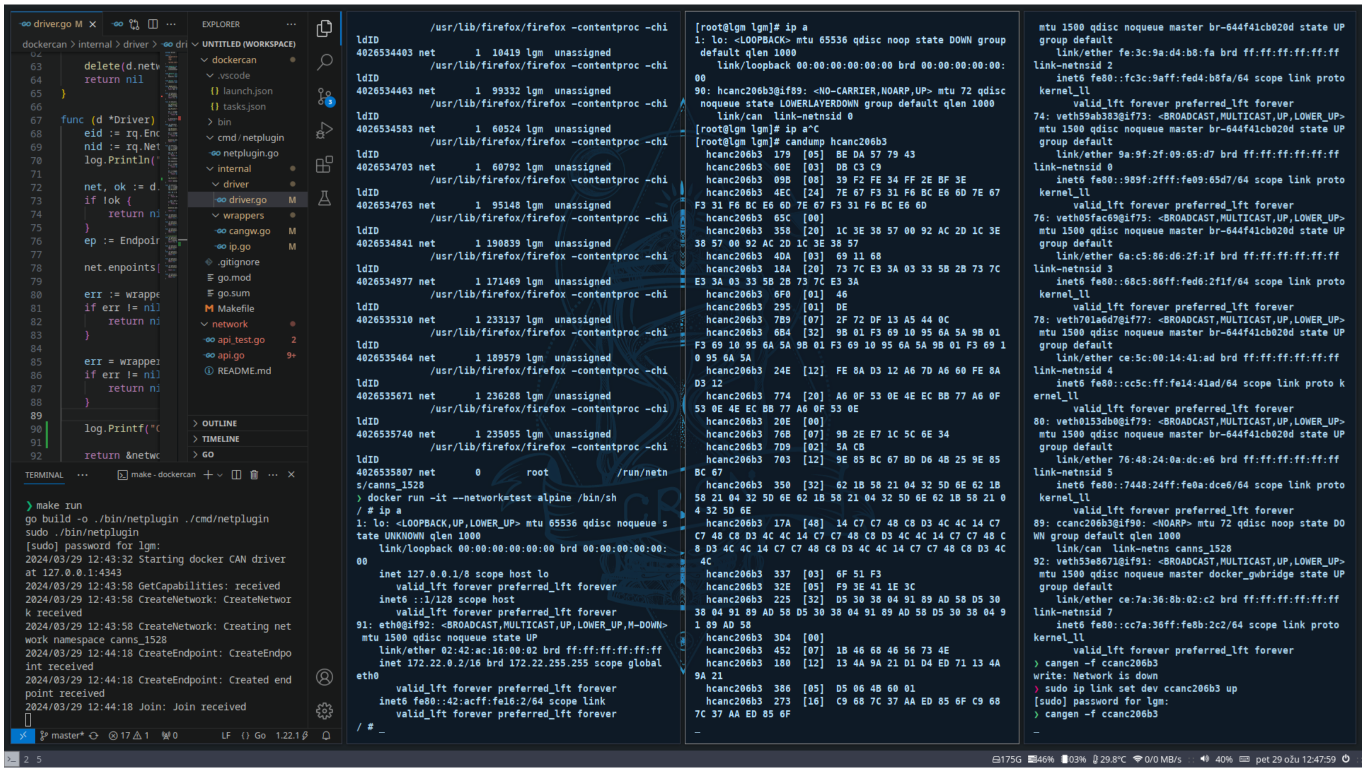
```
sudo ip netns exec test cangw -A -s vcan0 -d testifp -X -e
```

ali

If no gateway and no default static route is set by the driver in the Join response, LibNetwork will add an additional interface to the sandbox connecting to a default gateway network (a bridge network named docker_gwbridge) and program the default gateway into the sandbox accordingly, pointing to the interface address of the bridge docker_gwbridge.

I to se trenutno dogadja, probati popraviti!

28.3.



```
        delete(d.netw
        return nil
}

func (d *Driver)
        eid := rq.Enc
        nid := rq.Net
        log.Println("

        net, ok := d.
        if !ok {
                return ni
        }
        ep := Endpoir

        net.enpoints[

        err := wrappe
        if err != nil
                return ni
        }

        err = wrapper
        if err != nil
                return ni
        }

        log.Printf("C

        return &netwo
```

```
❯ make run
go build -o ./bin/netplugin ./cmd/netplugin
sudo ./bin/netplugin
[sudo] password for lgm:
2024/03/29 12:43:32 Starting docker CAN driver
at 127.0.0.1:4343
2024/03/29 12:43:58 GetCapabilities: received
2024/03/29 12:43:58 CreateNetwork: CreateNetwor
k received
2024/03/29 12:43:58 CreateNetwork: Creating net
work namespace canns_1528
2024/03/29 12:44:18 CreateEndpoint: CreateEndpo
int received
2024/03/29 12:44:18 CreateEndpoint: Created end
point received
2024/03/29 12:44:18 Join: Join received
```

```
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534403 net       1  10419 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534463 net       1  99332 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534583 net       1  60524 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534703 net       1  60792 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534763 net       1  95148 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534841 net       1 190839 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026534977 net       1 171469 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026535310 net       1 233137 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026535464 net       1 189579 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026535671 net       1 236288 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026535740 net       1 235055 lgm  unassigned
             /usr/lib/firefox/firefox -contentproc -chi
ldID
4026535807 net       0        root            /run/netn
s/canns_1528
❯ docker run -it --network=test alpine /bin/sh
/ # ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue s
tate UNKNOWN qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:
00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
91: eth0@if92: <BROADCAST,MULTICAST,UP,LOWER_UP,M-DOWN>
 mtu 1500 qdisc noqueue state UP
    link/ether 02:42:ac:16:00:02 brd ff:ff:ff:ff:ff:ff
    inet 172.22.0.2/16 brd 172.22.255.255 scope global
eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::42:acff:fe16:2/64 scope link
       valid_lft forever preferred_lft forever
/ # _
```

```
[root@lgm lgm]# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group
 default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:
00
90: hcanc206b3@if89: <NO-CARRIER,NOARP,UP> mtu 72 qdisc
 noqueue state LOWERLAYERDOWN group default qlen 1000
    link/can  link-netnsid 0
[root@lgm lgm]# ip a^C
[root@lgm lgm]# candump hcanc206b3
  hcanc206b3  179  [05]  BE DA 57 79 43
  hcanc206b3  60E  [03]  DB C3 C9
  hcanc206b3  09B  [08]  39 F2 FE 34 FF 2E BF 3E
  hcanc206b3  4EC  [24]  7E 67 F3 31 F6 BC E6 6D 7E 67
F3 31 F6 BC E6 6D 7E 67 F3 31 F6 BC E6 6D
  hcanc206b3  65C  [00]
  hcanc206b3  358  [20]  1C 3E 38 57 00 92 AC 2D 1C 3E
38 57 00 92 AC 2D 1C 3E 38 57
  hcanc206b3  4DA  [03]  69 11 68
  hcanc206b3  18A  [20]  73 7C E3 3A 03 33 5B 2B 73 7C
E3 3A 03 33 5B 2B 73 7C E3 3A
  hcanc206b3  6F0  [01]  46
  hcanc206b3  295  [01]  DE
  hcanc206b3  7B9  [07]  2F 72 DF 13 A5 44 0C
  hcanc206b3  6B4  [32]  9B 01 F3 69 10 95 6A 5A 9B 01
F3 69 10 95 6A 5A 9B 01 F3 69 10 95 6A 5A 9B 01 F3 69 1
0 95 6A 5A
  hcanc206b3  24E  [12]  FE 8A D3 12 A6 7D A6 60 FE 8A
D3 12
  hcanc206b3  774  [20]  A6 0F 53 0E 4E EC BB 77 A6 0F
53 0E 4E EC BB 77 A6 0F 53 0E
  hcanc206b3  20E  [00]
  hcanc206b3  76B  [07]  9B 2E E7 1C 5C 6E 34
  hcanc206b3  7D9  [02]  5A CB
  hcanc206b3  703  [12]  9E 85 BC 67 BD D6 4B 25 9E 85
BC 67
  hcanc206b3  350  [32]  62 1B 58 21 04 32 5D 6E 62 1B
58 21 04 32 5D 6E 62 1B 58 21 04 32 5D 6E 62 1B 58 21 0
4 32 5D 6E
  hcanc206b3  17A  [48]  14 C7 C7 48 C8 D3 4C 4C 14 C7
C7 48 C8 D3 4C 4C 14 C7 C7 48 C8 D3 4C 4C 14 C7 C7 48 C
8 D3 4C 4C 14 C7 C7 48 C8 D3 4C 4C 14 C7 C7 48 C8 D3 4C
 4C
  hcanc206b3  337  [03]  6F 51 F3
  hcanc206b3  32E  [05]  F9 3E 41 1E 3C
  hcanc206b3  225  [32]  D5 30 38 04 91 89 AD 58 D5 30
38 04 91 89 AD 58 D5 30 38 04 91 89 AD 58 D5 30 38 04 9
1 89 AD 58
  hcanc206b3  3D4  [00]
  hcanc206b3  452  [07]  1B 46 68 46 56 73 4E
  hcanc206b3  180  [12]  13 4A 9A 21 D1 D4 ED 71 13 4A
9A 21
  hcanc206b3  386  [05]  D5 06 4B 60 01
  hcanc206b3  273  [16]  C9 68 7C 37 AA ED 85 6F C9 68
7C 37 AA ED 85 6F

_
```

```
 mtu 1500 qdisc noqueue master br-644f41cb020d state UP
 group default
    link/ether fe:3c:9a:d4:b8:fa brd ff:ff:ff:ff:ff:ff
link-netnsid 2
    inet6 fe80::fc3c:9aff:fed4:b8fa/64 scope link proto
 kernel_ll
       valid_lft forever preferred_lft forever
74: veth59ab383@if73: <BROADCAST,MULTICAST,UP,LOWER_UP>
 mtu 1500 qdisc noqueue master br-644f41cb020d state UP
 group default
    link/ether 9a:9f:2f:09:65:d7 brd ff:ff:ff:ff:ff:ff
link-netnsid 0
    inet6 fe80::989f:2fff:fe09:65d7/64 scope link proto
 kernel_ll
       valid_lft forever preferred_lft forever
76: veth05fac69@if75: <BROADCAST,MULTICAST,UP,LOWER_UP>
 mtu 1500 qdisc noqueue master br-644f41cb020d state UP
 group default
    link/ether 6a:c5:86:d6:2f:1f brd ff:ff:ff:ff:ff:ff
link-netnsid 3
    inet6 fe80::68c5:86ff:fed6:2f1f/64 scope link proto
 kernel_ll
       valid_lft forever preferred_lft forever
78: veth701a6d7@if77: <BROADCAST,MULTICAST,UP,LOWER_UP>
 mtu 1500 qdisc noqueue master br-644f41cb020d state UP
 group default
    link/ether ce:5c:00:14:41:ad brd ff:ff:ff:ff:ff:ff
link-netnsid 4
    inet6 fe80::cc5c:ff:fe14:41ad/64 scope link proto k
ernel_ll
       valid_lft forever preferred_lft forever
80: veth0153db0@if79: <BROADCAST,MULTICAST,UP,LOWER_UP>
 mtu 1500 qdisc noqueue master br-644f41cb020d state UP
 group default
    link/ether 76:48:24:0a:dc:e6 brd ff:ff:ff:ff:ff:ff
link-netnsid 5
    inet6 fe80::7448:24ff:fe0a:dce6/64 scope link proto
 kernel_ll
       valid_lft forever preferred_lft forever
89: ccanc206b3@if90: <NOARP> mtu 72 qdisc noop state DO
WN group default qlen 1000
    link/can  link-netns canns_1528
92: veth53e8671@if91: <BROADCAST,MULTICAST,UP,LOWER_UP>
 mtu 1500 qdisc noqueue master docker_gwbridge state UP
 group default
    link/ether ce:7a:36:8b:02:c2 brd ff:ff:ff:ff:ff:ff
link-netnsid 7
    inet6 fe80::cc7a:36ff:fe8b:2c2/64 scope link proto
kernel_ll
       valid_lft forever preferred_lft forever
❯ cangen -f ccanc206b3
write: Network is down
❯ sudo ip link set dev ccanc206b3 up
[sudo] password for lgm:
❯ cangen -f ccanc206b3

_
```

```
175G  46%  03%  29.8°C  0/0 MB/s  40%  pet 29 ožu 12:47:59
```

cangen - candump izmedju dva sucelja u razlicitim namespaceovima kreiranim docker network driverom

brisanje i dodavanje sucelja u drugom namespaceu:

```
❯ sudo ip netns exec canns ip link add dev vcan0 type vcan
❯ sudo ip netns exec canns ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: vcan0: <NOARP> mtu 72 qdisc noop state DOWN group default qlen 1000
    link/can
❯ sudo ip netns exec canns ip link del dev vcan0
```

29.3.

Implementirao sve funkcije drivera i driver radi, preostalo je:

- driver
  - napraviti "graceful" gasenje drivera u slucaju ctrl c
  - dodati opciju instalacije putem dockerhub-a
  - ~~dodati opciju instalacije putem systemd~~
  - ~~README~~
- rad opcenito
  - napraviti gw program koji bi povezivao razlicite can sabirnice
  - napraviti template s callbackovima za ECU programe
    - CAN, UDS, XCP, OBD2
  - osmisliti povezivanje s vanjskim programima primjerice za vizualni prikaz rezultata
  - napraviti nekoliko zadataka koji koriste te funkcionalnosti

30.3.

Pisanje systemd file-a i instalacijske skripte

- https://www.shubhamdipt.com/blog/how-to-create-a-systemd-service-in-linux/
- https://docs.docker.com/engine/extend/plugin_api/#systemd-socket-activation
  - ne koristimo socket, ali dobar za template

```
[Unit]
Description=Dockercan network plugin
```

```
Before=docker.service
After=network.target
Requires=docker.service

[Service]
User=root
ExecStart=/usr/lib/docker/dockercan

[Install]
WantedBy=multi-user.target
```

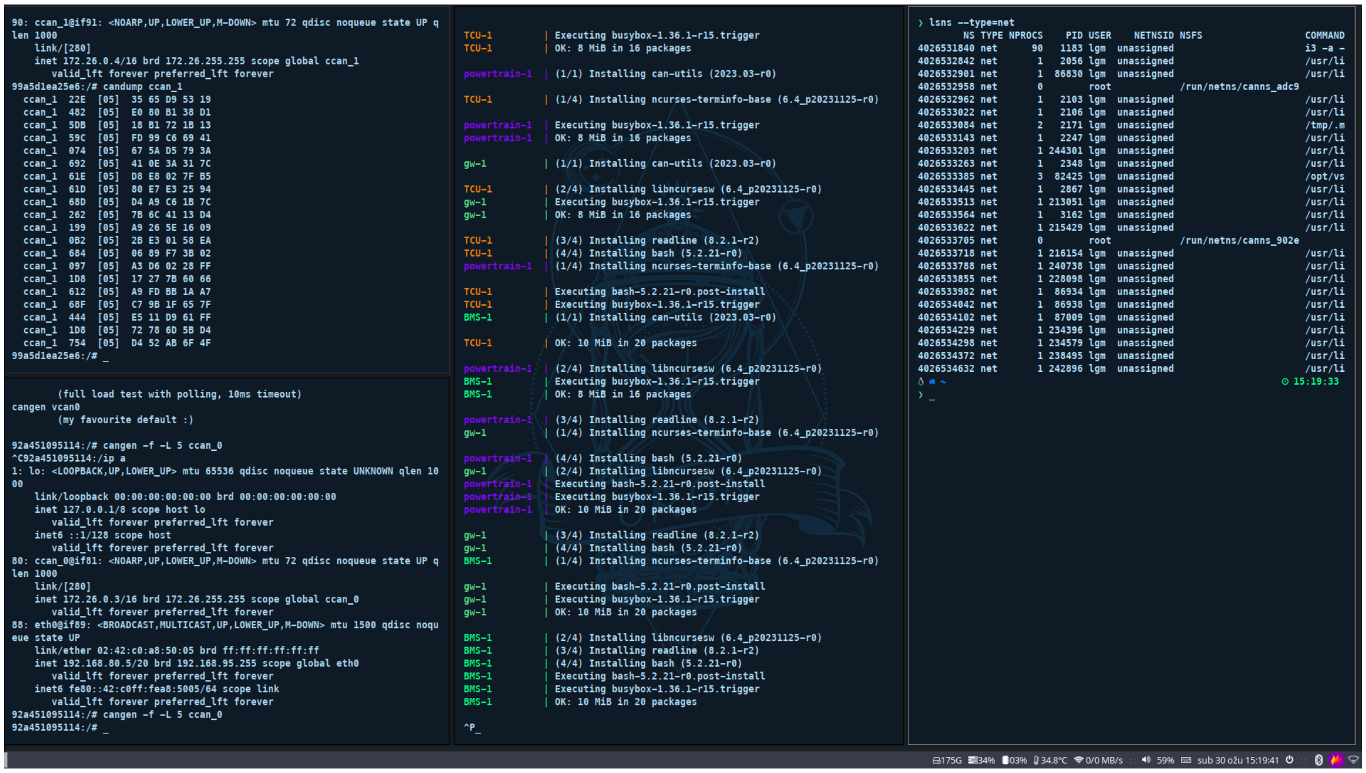
Testiranje s docker composeom:

```yaml
services:
  powertrain:
    image: alpine
    networks: [ can2 ]
    tty: true
    command:
      - /bin/sh
      - -c
      - |
        apk add can-utils
        apk add bash
        tail -f /dev/null

  BMS:
    image: alpine
    networks: [ can2 ]
    tty: true
    command:
      - /bin/sh
      - -c
      - |
        apk add can-utils
        apk add bash
        tail -f /dev/null

  TCU:
    image: alpine
    networks: [ can1 ]
    tty: true
    command:
      - /bin/sh
      - -c
      - |
        apk add can-utils
        apk add bash
        tail -f /dev/null
  gw:
    image: alpine
    networks:
      - can2
      - can1
    tty: true
    command:
      - /bin/sh
      - -c
      - |
        apk add can-utils
        apk add bash
        tail -f /dev/null

networks:
  can2:
    driver: dockercan
    driver_opts:
      centralised: "false"
      canfd: "true"

  can1:
    driver: dockercan
    driver_opts:
      centralised: "false"
      canfd: "true"
```

Output drivera:

```
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateNetwork:
CreateNetwork received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateNetwork:
Creating network namespace canns_adc9
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateNetwork:
CreateNetwork received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateNetwork:
Creating network namespace canns_902e
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateEndpoint:
CreateEndpoint received
```

```
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateEndpoint: CreateEndpoint received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateEndpoint: CreateEndpoint received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 CreateEndpoint: CreateEndpoint received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 Join: Join received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 Join: Join received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 Join: Join received
ožu 30 15:16:42 lgm dockercan[221780]: 2024/03/30 15:16:42 Join: Join received
ožu 30 15:16:43 lgm dockercan[221780]: 2024/03/30 15:16:43 CreateEndpoint: CreateEndpoint received
ožu 30 15:16:43 lgm dockercan[221780]: 2024/03/30 15:16:43 Join: Join received
```



```
90: ccan_1@if91: <NOARP,UP,LOWER_UP,M-DOWN> mtu 72 qdisc noqueue state UP q
len 1000
    link/[280]
    inet 172.26.0.4/16 brd 172.26.255.255 scope global ccan_1
       valid_lft forever preferred_lft forever
99a5d1ea25e6:/# candump ccan_1
  ccan_1  22E   [05]  35 65 D9 53 19
  ccan_1  482   [05]  E0 80 B1 38 D1
  ccan_1  5DB   [05]  18 B1 72 1B 13
  ccan_1  59C   [05]  FD 99 C6 69 41
  ccan_1  074   [05]  67 5A D5 79 3A
  ccan_1  692   [05]  41 0E 3A 31 7C
  ccan_1  61E   [05]  D8 E8 02 7F B5
  ccan_1  61D   [05]  80 E7 E3 25 94
  ccan_1  68D   [05]  D4 A9 C6 1B 7C
  ccan_1  262   [05]  7B 6C 41 13 D4
  ccan_1  199   [05]  A9 26 5E 16 09
  ccan_1  0B2   [05]  2B E3 01 58 EA
  ccan_1  684   [05]  06 89 F7 3B 02
  ccan_1  097   [05]  A3 D6 02 28 FF
  ccan_1  1D8   [05]  17 27 7B 60 66
  ccan_1  612   [05]  A9 FD BB 1A A7
  ccan_1  68F   [05]  C7 9B 1F 65 7F
  ccan_1  444   [05]  E5 11 D9 61 FF
  ccan_1  1D8   [05]  72 78 6D 5B D4
  ccan_1  754   [05]  D4 52 AB 6F 4F
99a5d1ea25e6:/# _
```

```
        (full load test with polling, 10ms timeout)
cangen vcan0
        (my favourite default :)

92a451095114:/# cangen -f -L 5 ccan_0
^C92a451095114:/ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN qlen 10
00
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
80: ccan_0@if81: <NOARP,UP,LOWER_UP,M-DOWN> mtu 72 qdisc noqueue state UP q
len 1000
    link/[280]
    inet 172.26.0.3/16 brd 172.26.255.255 scope global ccan_0
       valid_lft forever preferred_lft forever
88: eth0@if89: <BROADCAST,MULTICAST,UP,LOWER_UP,M-DOWN> mtu 1500 qdisc noqu
eue state UP
    link/ether 02:42:c0:a8:50:05 brd ff:ff:ff:ff:ff:ff
    inet 192.168.80.5/20 brd 192.168.95.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::42:c0ff:fea8:5005/64 scope link
       valid_lft forever preferred_lft forever
92a451095114:/# cangen -f -L 5 ccan_0
92a451095114:/# _
```

```
TCU-1         | Executing busybox-1.36.1-r15.trigger
TCU-1         | OK: 8 MiB in 16 packages

powertrain-1  | (1/1) Installing can-utils (2023.03-r0)

TCU-1         | (1/4) Installing ncurses-terminfo-base (6.4_p20231125-r0)

powertrain-1  | Executing busybox-1.36.1-r15.trigger
powertrain-1  | OK: 8 MiB in 16 packages

gw-1          | (1/1) Installing can-utils (2023.03-r0)

TCU-1         | (2/4) Installing libncursesw (6.4_p20231125-r0)
gw-1          | Executing busybox-1.36.1-r15.trigger
gw-1          | OK: 8 MiB in 16 packages

TCU-1         | (3/4) Installing readline (8.2.1-r2)
TCU-1         | (4/4) Installing bash (5.2.21-r0)
powertrain-1  | (1/4) Installing ncurses-terminfo-base (6.4_p20231125-r0)

TCU-1         | Executing bash-5.2.21-r0.post-install
TCU-1         | Executing busybox-1.36.1-r15.trigger
BMS-1         | (1/1) Installing can-utils (2023.03-r0)

TCU-1         | OK: 10 MiB in 20 packages

powertrain-1  | (2/4) Installing libncursesw (6.4_p20231125-r0)
BMS-1         | Executing busybox-1.36.1-r15.trigger
BMS-1         | OK: 8 MiB in 16 packages

powertrain-1  | (3/4) Installing readline (8.2.1-r2)
gw-1          | (1/4) Installing ncurses-terminfo-base (6.4_p20231125-r0)

powertrain-1  | (4/4) Installing bash (5.2.21-r0)
gw-1          | (2/4) Installing libncursesw (6.4_p20231125-r0)
powertrain-1  | Executing bash-5.2.21-r0.post-install
powertrain-1  | Executing busybox-1.36.1-r15.trigger
powertrain-1  | OK: 10 MiB in 20 packages

gw-1          | (3/4) Installing readline (8.2.1-r2)
gw-1          | (4/4) Installing bash (5.2.21-r0)
BMS-1         | (1/4) Installing ncurses-terminfo-base (6.4_p20231125-r0)

gw-1          | Executing bash-5.2.21-r0.post-install
gw-1          | Executing busybox-1.36.1-r15.trigger
gw-1          | OK: 10 MiB in 20 packages

BMS-1         | (2/4) Installing libncursesw (6.4_p20231125-r0)
BMS-1         | (3/4) Installing readline (8.2.1-r2)
BMS-1         | (4/4) Installing bash (5.2.21-r0)
BMS-1         | Executing bash-5.2.21-r0.post-install
BMS-1         | Executing busybox-1.36.1-r15.trigger
BMS-1         | OK: 10 MiB in 20 packages

^P_
```

```
❯ lsns --type=net
        NS TYPE NPROCS    PID USER    NETNSID NSFS                   COMMAND
4026531840 net      90   1183 lgm  unassigned                        i3 -a -
4026532842 net       1   2056 lgm  unassigned                        /usr/li
4026532901 net       1  86830 lgm  unassigned                        /usr/li
4026532958 net       0        root            /run/netns/canns_adc9
4026532962 net       1   2103 lgm  unassigned                        /usr/li
4026533022 net       1   2106 lgm  unassigned                        /usr/li
4026533084 net       2   2171 lgm  unassigned                        /tmp/.m
4026533143 net       1   2247 lgm  unassigned                        /usr/li
4026533203 net       1 244301 lgm  unassigned                        /usr/li
4026533263 net       1   2348 lgm  unassigned                        /usr/li
4026533385 net       3  82425 lgm  unassigned                        /opt/vs
4026533445 net       1   2867 lgm  unassigned                        /usr/li
4026533513 net       1 213051 lgm  unassigned                        /usr/li
4026533564 net       1   3162 lgm  unassigned                        /usr/li
4026533622 net       1 215429 lgm  unassigned                        /usr/li
4026533705 net       0        root            /run/netns/canns_902e
4026533718 net       1 216154 lgm  unassigned                        /usr/li
4026533788 net       1 240738 lgm  unassigned                        /usr/li
4026533855 net       1 228098 lgm  unassigned                        /usr/li
4026533982 net       1  86934 lgm  unassigned                        /usr/li
4026534042 net       1  86938 lgm  unassigned                        /usr/li
4026534102 net       1  87009 lgm  unassigned                        /usr/li
4026534229 net       1 234396 lgm  unassigned                        /usr/li
4026534298 net       1 234579 lgm  unassigned                        /usr/li
4026534372 net       1 238495 lgm  unassigned                        /usr/li
4026534632 net       1 242896 lgm  unassigned                        /usr/li
 ~                                                          15:19:33
❯ _
```

Izrada programa za ECU-ove

Izvori

CAN

- https://www.csselectronics.com/pages/can-bus-simple-intro-tutorial
- https://s3.eu-central-1.amazonaws.com/cancia-de/documents/proceedings/slides/hartkopp_slides_15icc.pdf
  OBD2
- https://www.csselectronics.com/pages/obd2-explained-simple-intro
  UDS
- https://www.csselectronics.com/pages/uds-protocol-tutorial-unified-diagnostic-services
- standard
  - https://web.archive.org/web/20180219141308/http://read.pudn.com/downloads191/doc/899044/ISO+14229+(2006).pdf
- https://github.com/openxc/uds-c
- https://berkerturk.medium.com/relationship-between-uds-iso-14229-1-and-iso-tp-iso-15765-2-235499145484
  - https://piembsystech.com/can-tp-protocol/
- https://www.atlantis-press.com/article/25862271.pdf
  XCP
- https://www.csselectronics.com/pages/ccp-xcp-on-can-bus-calibration-protocol

Postojeca programska rjesenja
https://github.com/zombieCraig/UDSim
https://github.com/zombieCraig/ICSim
https://github.com/pschichtel/VirtualECU
https://github.com/pschichtel/JavaCAN?tab=readme-ov-file

CAN

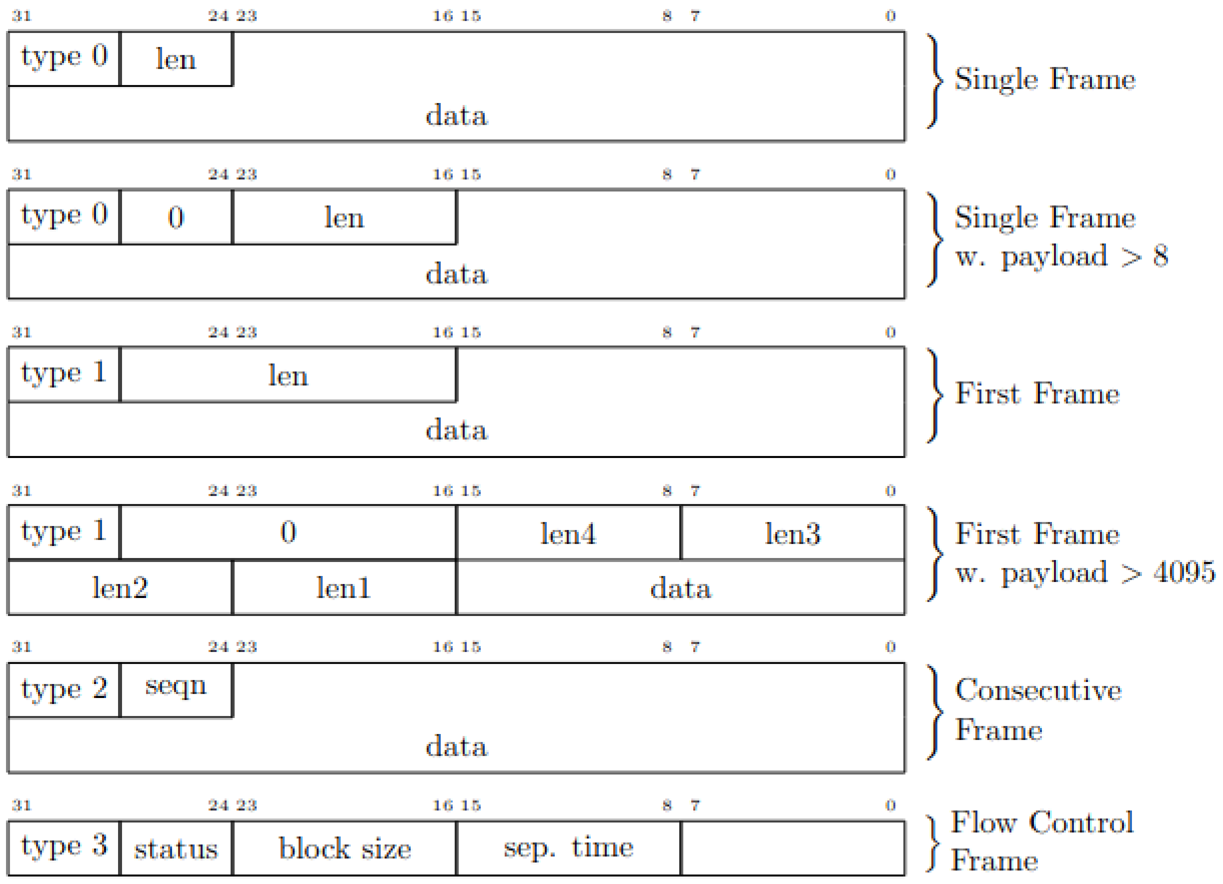
https://munich.dissec.to/kb/chapters/can/can.html#can-node

- bit stuffing, crc, ack, arbitrazu, retransmisiju inace odradjuje CAN controller (odvojena komponenta od MCU-a)

CAN FD

- razlike s CAN-om
  - https://munich.dissec.to/kb/chapters/can/canfd.html
  - fizicki sloj isti
  - nas brine samo duljina podataka koja vise nije 8 nego 64 okteta
    - ostale promjene su na fizickom sloju
  -

ISO-TP



socketcan

- podrzava standardni CAN (CAN 2.0), CAN FD i CAN XL
- na transportnom sloju podrzava ISOTP kojeg koristi UDS
  - can-utils alati isotpsend, isotprecv, isotpsniffer
  - obzirom da podrzava ISO-TP, ako bi isao implementirati UDS, moram se brinuti samo o sadrzaju poruka, jezgra se brine o transportnom sloju

```
❯ echo "09 02" | isotpsend -s 7de -d 7e8 vcan0
❯ echo "09 02" | isotpsend -s 7de -d 7e8 vcan0
❯ echo "09 02" | isotpsend -s 7de -d 7e8 vcan0
❯ echo "09 02" | isotpsend -s 7de -d 7e8 vcan0
❯ echo "09 02" | isotpsend -s 7de -d 7e8 vcan0
```

```
❯ isotpsniffer -d 7e8 -s 7de vcan0
 vcan0  7DE  [2]  09 02  - '..'
 vcan0  7DE  [2]  09 02  - '..'
```

```
vcan0  7DE  [2]  09 02  - '..'
vcan0  7DE  [2]  09 02  - '..'
```

https://github.com/linux-can/can-utils/blob/master/include/linux/can.h

```
struct can_frame {
        canid_t can_id;  /* 32 bit CAN_ID + EFF/RTR/ERR flags */
        union {
                /* CAN frame payload length in byte (0 .. CAN_MAX_DLEN)
                 * was previously named can_dlc so we need to carry that
                 * name for legacy support
                 */
                __u8 len;
                __u8 can_dlc; /* deprecated */
        } __attribute__((packed)); /* disable padding added in some ABIs */
        __u8 __pad; /* padding */
        __u8 __res0; /* reserved / padding */
        __u8 len8_dlc; /* optional DLC for 8 byte payload length (9 .. 15)
*/
        __u8 data[CAN_MAX_DLEN] __attribute__((aligned(8)));
};

struct canfd_frame {
        canid_t can_id;  /* 32 bit CAN_ID + EFF/RTR/ERR flags */
        __u8    len;     /* frame payload length in byte */
        __u8    flags;   /* additional flags for CAN FD */
        __u8    __res0;  /* reserved / padding */
        __u8    __res1;  /* reserved / padding */
        __u8    data[CANFD_MAX_DLEN] __attribute__((aligned(8)));
};
```

CAN_ID je definiran kao u32 integer, ali:
Below is a standard CAN frame with 11 bits identifier (CAN 2.0A), which is the type used in most cars. The extended 29-bit identifier frame (CAN 2.0B) is identical except the longer ID. It is e.g. used in the J1939 protocol for heavy-duty vehicles.

- protokolima viseg sloja nije bitna duljina ID-a