

System Administration

Week 04, Segment 1 Types of Software

Department of Computer Science
Stevens Institute of Technology

Jan Schaumann

jschauma@stevens.edu

<https://stevens.netmeister.org/615/>



Terminal – 80x24

```
[ip-10-10-0-13# printf '🐱🐱❄️' | dd of=/dev/xbd1 bs=1 seek=8]
```

14+0 records in

14+0 records out

14 bytes transferred in 0.001 secs (14000 bytes/sec)

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 count=1 2>/dev/null)\n"]
```

🐱🐱❄️

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=4 skip=4 2>/dev/null)\n"]
```

🐶

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=4 skip=8 2>/dev/null)\n"]
```

🐱

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=12 skip=8 2>/dev/null)\n"]
```

🐱🐱✳️?

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=12 skip=8 2>/dev/null)\n"]
```

```
[ip-10-10-0-13# dd if=/dev/xbd1 count=1 2>/dev/null | hexdump -C]
```

00000000 f0 9f 98 b8 f0 9f 98 bb f0 9f 90 88 f0 9f 90 88 |.....|

00000010 e2 9d 84 ef b8 8f 00 00 00 00 00 00 00 00 00 |.....|

00000020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|

*

00000200

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=13 skip=8 2>/dev/null)\n"]
```

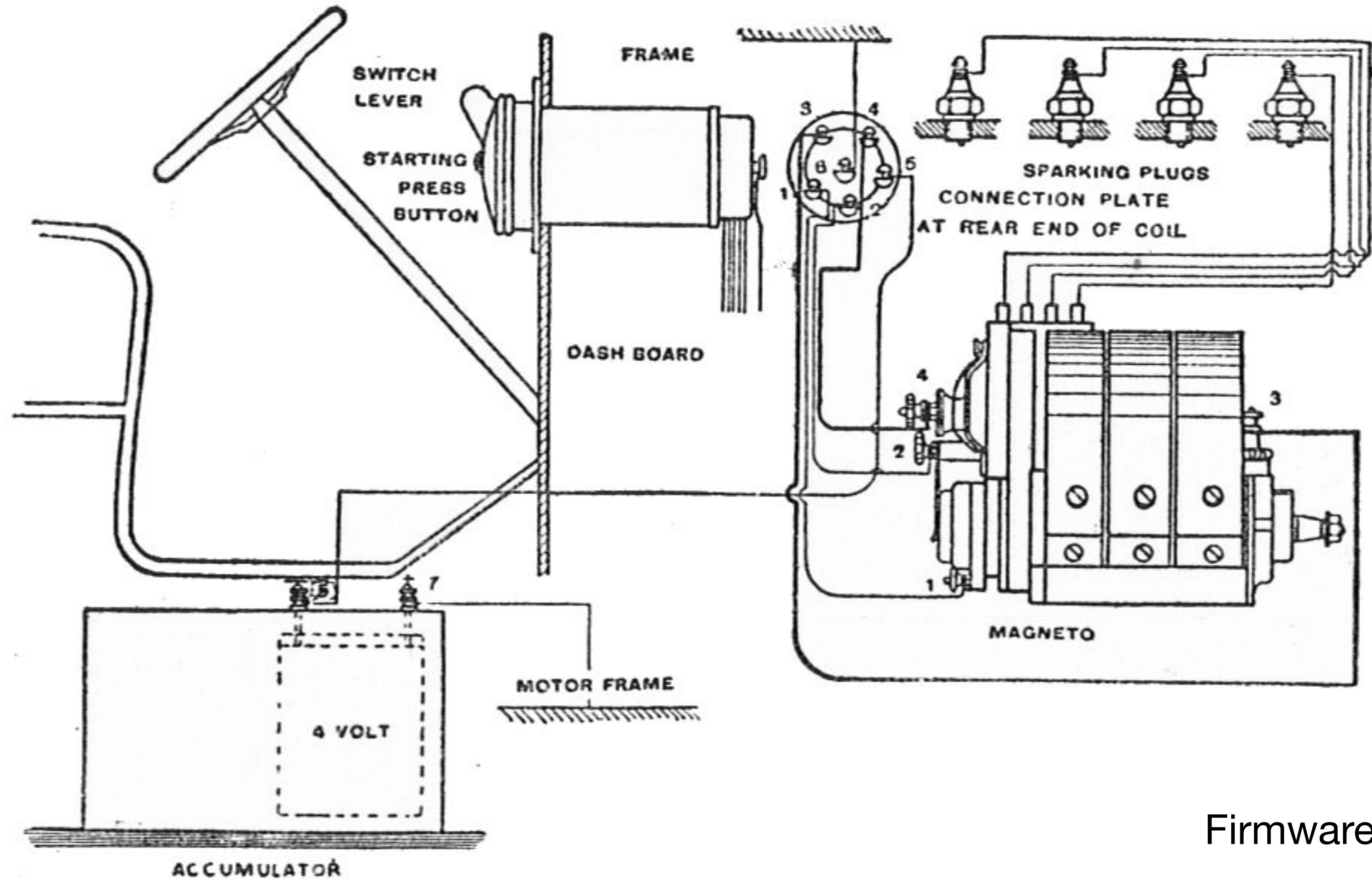
🐱🐱✳️?

```
[ip-10-10-0-13# printf "$(dd if=/dev/xbd1 bs=1 count=14 skip=8 2>/dev/null)\n"]
```

🐱🐱❄️

```
ip-10-10-0-13#
```





Firmware



- ▶ Standard CMOS Features
- ▶ Advanced BIOS Features
- ▶ Advanced Chipset Features
- ▶ Integrated Peripherals
- ▶ Power Management Setup
- ▶ PnP/PCI Configurations
- ▶ PC Health Status

- ▶ Frequency/Voltage Control
- Load Fail-Safe Defaults
- Load Optimized Defaults
- Set Supervisor Password
- Set User Password
- Save & Exit Setup
- Exit Without Saving

Esc : Quit

F10 : Save & Exit Setup

↑ ↓ → ← : Select Item

Time, Date, Hard Disk Type...

```
Incorrect configuration checksum;  
Setting NVRAM parameters to default values.  
Setting diag-switch? NVRAM parameter to true  
Probing /sbuse@1,f8000000 at 0,0 dma esp sd st le  
Probing /sbuse@1,f8000000 at 1,0 cgthree  
Probing /sbuse@1,f8000000 at 2,0 Nothing there  
Probing /sbuse@1,f8000000 at 3,0 Nothing there
```



SPARCstation 2, Keyboard Present
ROM Rev. 2.9, 16 MB memory installed, Serial #1296.
Ethernet address 8:0:20:10:31:3, Host ID: 55000510.

```
Testing 16 megs of memory 14  
Type b (boot), c (continue), or n (new command mode)  
>n  
Type help for more information  
ok setenv diag-switch? false  
diag-switch? = false  
ok setenv selftest-#megs 0  
selftest-#megs = 0  
ok boot cdrom  
Boot device: /sbus/esp@0,800000/sd@6,0:c File and args:  
>> NetBSD/sparc Secondary Boot, Revision 1.15  
>> (builds@b3.netbsd.org, Tue Oct 31 08:41:58 UTC 2006)  
Booting netbsd  
1525520\
```

The Kernel

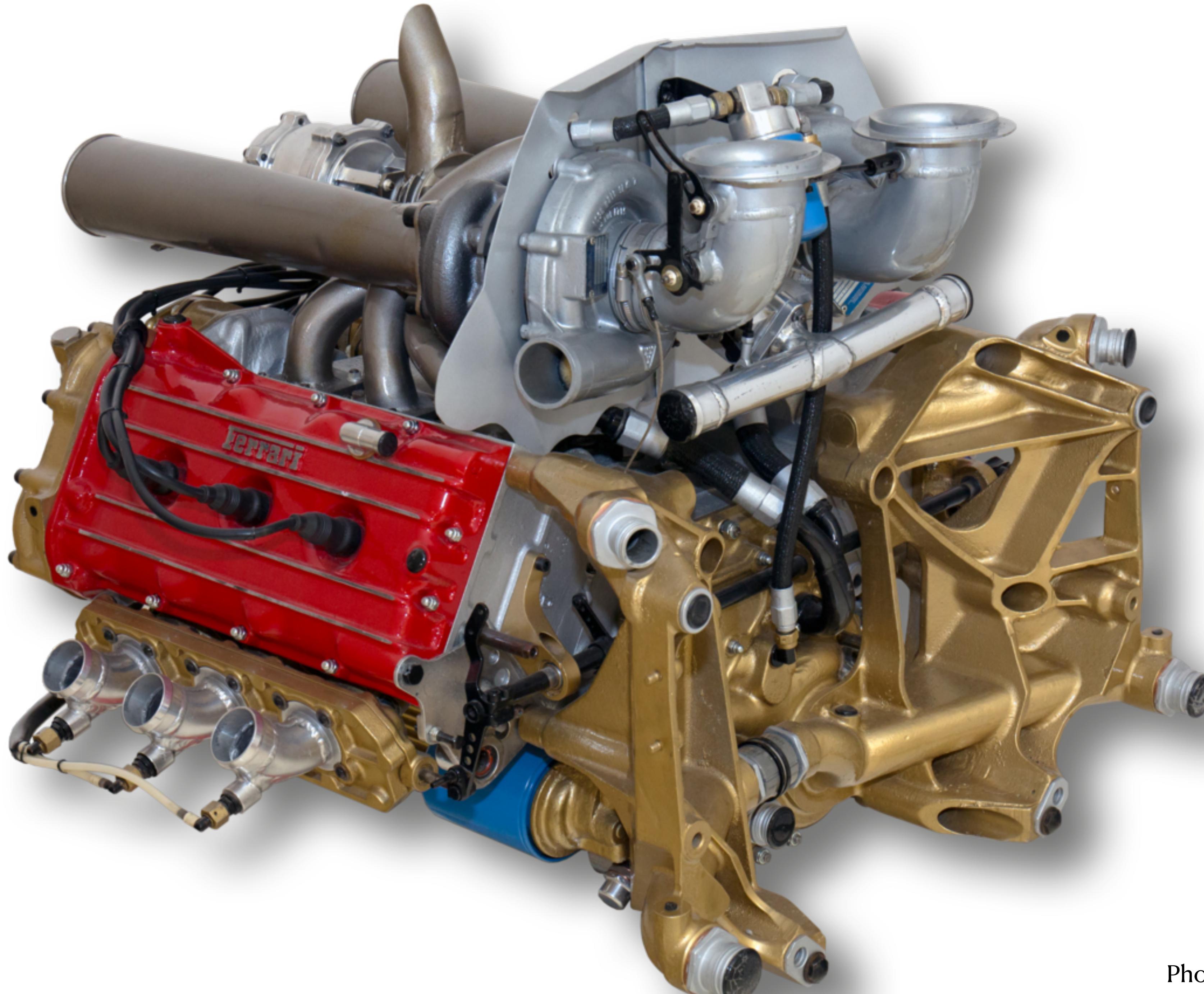
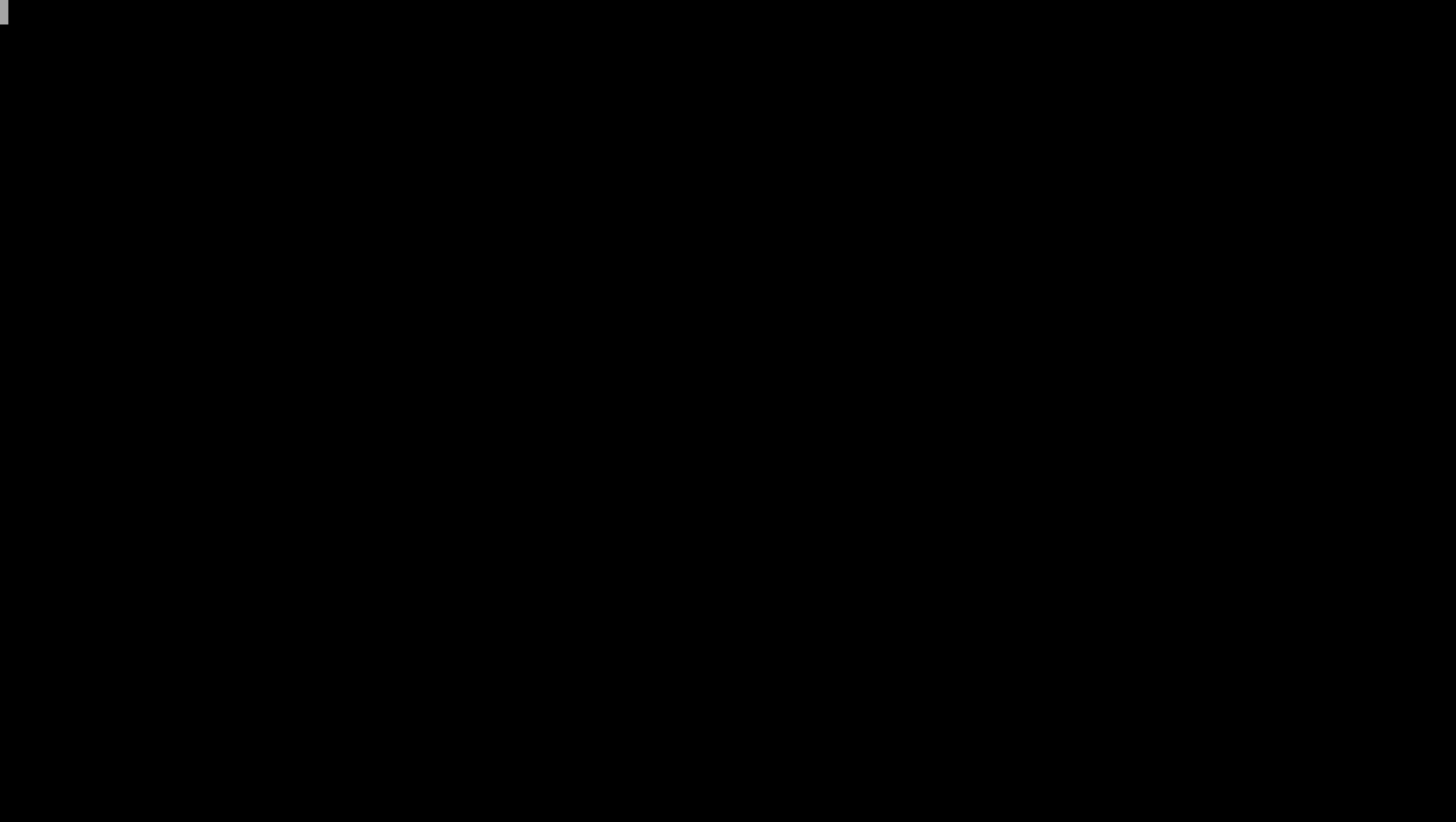


Photo by User Mirio on Wikipedia
https://commons.wikimedia.org/wiki/File:Ferrari_021_engine_front_Museo_Ferrari_noBG.png



The OS



```
I 4.0168161] wsbell at spkr1 not configured
I 4.0203645] wd0 at atabus0 drive 0
I 4.0203645] wd0: <UBOX HARDDISK>
I 4.0203645] wd0: 16384 MB, 33288 cyl, 16 head, 63 sec, 512 bytes/sect x 3355
432 sectors
I 4.0286333] dk0 at wd0: "72b05bfc-a142-4294-bb77-1f5c401dbcec", 31457213 bloc
ks at 64, type: ffs
I 4.0286333] dk1 at wd0: "7890141d-85c7-4abd-9b8f-66be6da5bbff", 2097119 bloc
ks at 31457280, type: swap
I 4.0286333] wd1 at atabus0 drive 1
I 4.0286333] wd1: <UBOX HARDDISK>
I 4.0286333] wd1: 500 MB, 1015 cyl, 16 head, 63 sec, 512 bytes/sect x 1024000
sectors
I 4.0386449] uhub0 at usb0: NetBSD (0x0000) OHCI root hub (0x0000), class 9/6
rev 1.00/1.00, addr 1
I 4.0386449] atapibus0 at atabus1: 2 targets
I 4.0386449] cd0 at atapibus0 drive 0: <UBOX CD-ROM, UB2-01700376, 1.0> cdrom
removable
I 4.7587337] WARNING: 1 error while detecting hardware: check system log.
I 4.7587337] boot device: wd0
I 4.7587337] root on dk0 dumps on dk1
I 4.7689671] root file system type: ffs
I 4.7689671] kern.module.path=/stand/amd64/9.99.76/modules
```

Sun Jan 10 19:59:16 UTC 2021



Truck Info



Gauge View

Air/Fuel Ratio



System Software

005432.5 km



PRNDM



S

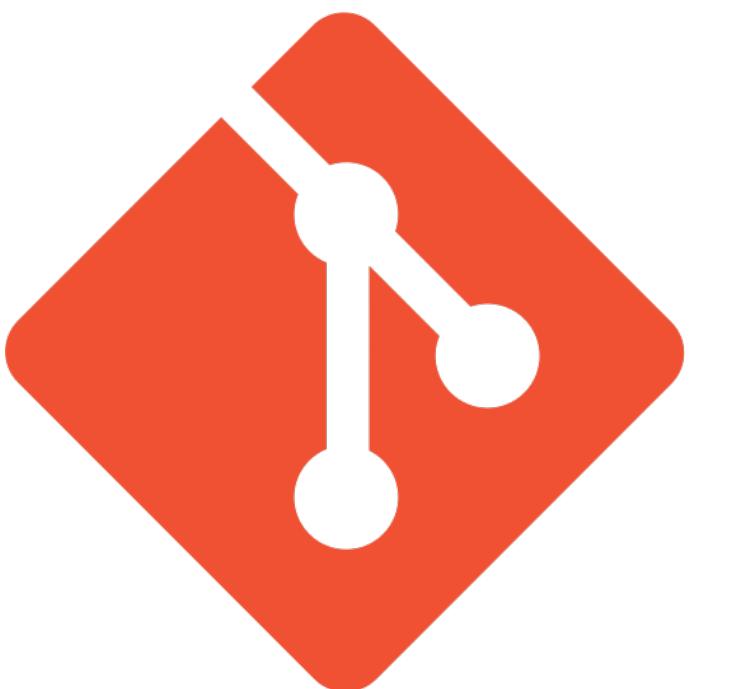
```
$ ls /bin
[          df          launchctl      pwd          tcsh
bash       domainname    link          rcp          test
cat        echo          ln            rm           unlink
chmod     ed            ls            rmdir        wait4path
cp         expr          mkdir         sh           zsh
csh        hostname      mv            sleep
date       kill          pax           stty
dd         ksh           ps            sync
$ ls -C /etc | head
6to4.conf                         master.passwd
CiscoSystemsVPNClient               memberd.conf
Product.Catalog.JavaLiveUpdate     moduli
Symantec.conf                      named.conf
afpovertcp.cfg                     nanorc
aliases                           networks
aliases.db                         newsyslog.conf
amavisd.conf                      newsyslog.d
apache2                            notify.conf
asl.conf                           ntp-restrict.conf
$
```



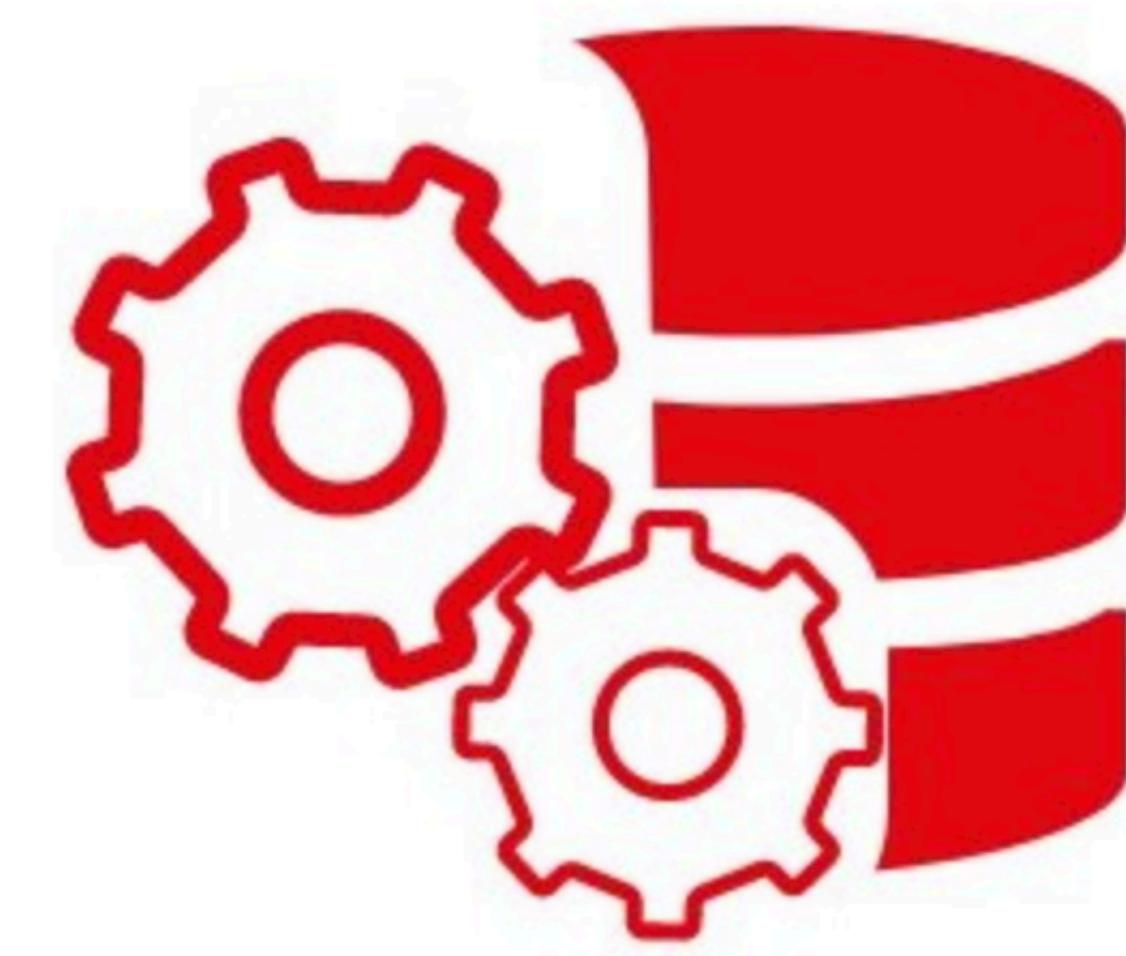
Add-on Applications and Customizations



APACHE
HTTP SERVER



git

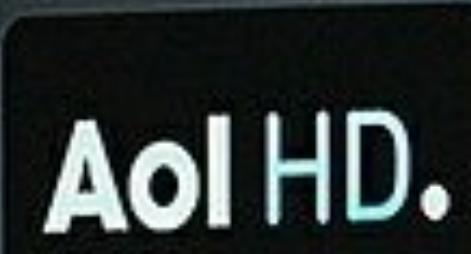
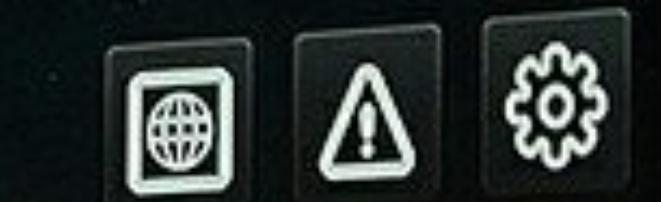


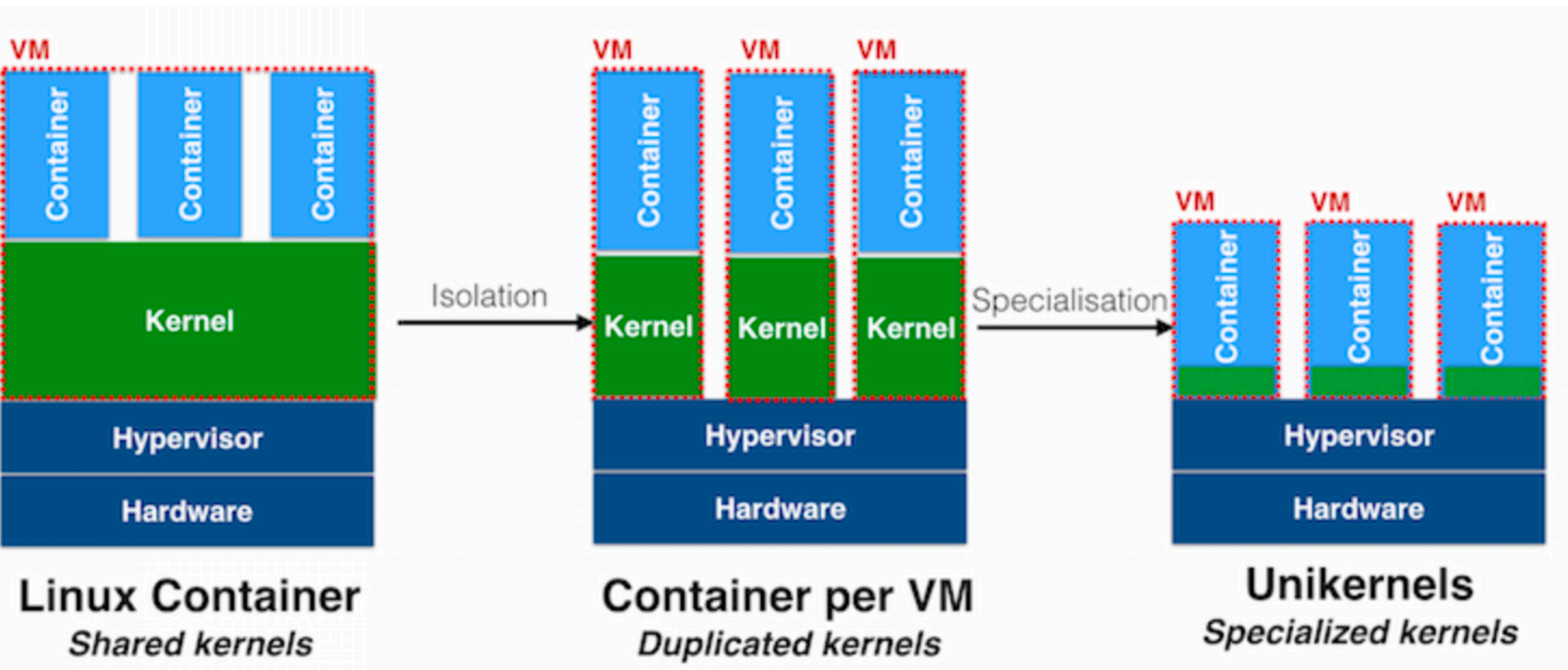
ORACLE®

10:12 AM



My Favorites





Summary and Questions

- Software is not at all like a car. (Few things are like a car. Except cars. Some of those are a lot like cars.)
- “Software” is software, even when it’s firmware or middleware.
- We tend to group software into categories:
 - “Low-level” / firmware
 - “OS”
 - “Add-on software”
- What’s the difference? How do we manage each category?
- What about IoT devices, appliances, special purpose systems, network devices, “the cloud”, ...?
- Review the boot process from POST to serving traffic — categorize the different types of software and think about how you’d update each.

Links

Software Installation and Package Management:

<https://www.netmeister.org/book/05-software-installation-and-package-management.pdf>

Unikernel and Immutable Infrastructures:

<https://github.com/cetic/unikernels>

Wikipedia, Firmware:

<https://en.wikipedia.org/wiki/Firmware>