Terminal Emulator Basics in Golang

By Ishuah Kariuki

$whoami

- Principal Backend
  Engineer @ UseHover.com
- Triathlete in active
  training
- Untenable troublemaker

The Linux TTY subsystem

How It Started

The Teletype/Teleprinter: a printing device resembling a typewriter that is used to send and receive telephonic signals

Used mostly in the early to mid-20th century

- Input: Keyboard

- Output: paper/ticker tape

- Medium: electrical signals

Computers With Paper Screens

1960s: Faster, more powerful computers that could interact with users in real time

Teletypes were adapted as I/O devices for early mainframe computers


```
MØNDAY MAY 10 1847

TØTAL MILEAGE IS 575
FØØD            BULLETS         CLØTHING        MISC. SUPP.     CASH
 46              1090            40              45              205
DØ YØU WANT TØ (1) STØP AT THE NEXT FØRT, (2) HUNT, ØR (3) CØNTINUE
?2
TYPE BANG  BANG
RIGHT BETWEEN THE EYES---YØU GØT A BIG ØNE!!!!
WATCH YØUR CALØRIES TØNIGHT!!!
DØ YØU WANT TØ EAT (1) PØØRLY  (2) MØDERATELY
ØR (3) WELL?2
HAIL STØRM---SUPPLIES DAMAGED
```

Teleprinter output of The Oregon Trail (1971)

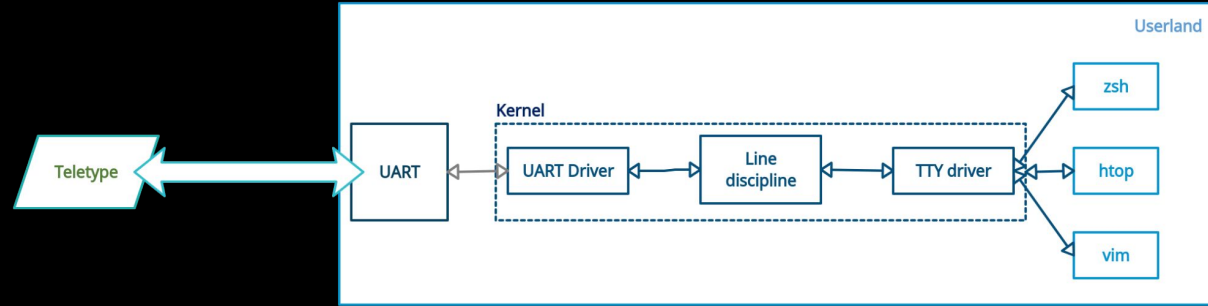# Upgrade to Video Terminals

Video Display Units replaced
hard-copy terminals

The Physical Terminal Connection

The TTY device consists of:

- UART Driver
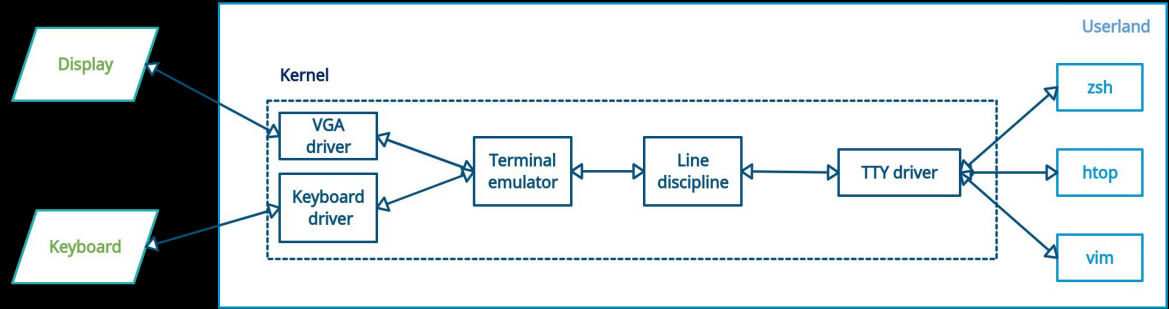- Line discipline
- TTY Driver

Virtual Terminals (Terminal Emulators)

A terminal emulator is a software application that replicates the functionalities of classic computer terminals.

```
[/home]$ ls
vidarlo
[/home]$ cd ..
[/]$ cd etc
[/etc]$ ls
0.0.10.in-addr.arpa   csh.cshrc           gshadow-            logrotate.d          odbcinst.ini        rmt
adduser.conf          csh.login           gtk                 lynx.cfg             openoffice          rpc
adjtime               csh.logout          host.conf           magic                opt                 screenrc
aliases               db.cache            hostname            mailcap              pam.conf            securetty
alternatives          debconf.conf        hosts               mailcap.order        pam.d               security
apm                   debian_version      hosts.allow         mailname             passwd              services
apt                   default             hosts.deny          mail.rc              passwd-             shadow
asterisk              defoma              hotplug             manpath.config       perl                shadow-
at.deny               deluser.conf        hotplug.d           mdadm                ppp                 shells
bakipkungfu           dhclient.conf       identd.conf         mediaprm             printcap            skel
bash.bashrc           dhclient-script     identd.key          mime.types           profile             squid
bash_completion       dictionaries-common inetd.conf          mkinitrd             protocols           ssh
bash_completion.d     discover.conf       init.d              modprobe.d           python2.3           sudoers
bind                  discover.conf-2.6   inittab             modules              raidtab             sysctl.conf
blkid.tab             discover.d          inputrc             modules.conf         rc0.d               syslog.conf
blkid.tab.old         dpkg                ipkungfu            modules.conf.old     rc1.d               terminfo
calendar              emacs               issue               modutils             rc2.d               timezone
chatscripts           emacs21             issue.net           motd                 rc3.d               ucf.conf
chkrootkit.conf       email-addresses     kernel-img.conf     mtab                 rc4.d               updatedb.conf
complete.tcsh         environment         ldap                mtools.conf          rc5.d               vidarlo.net.hosts
console               exim4               ld.so.cache         Muttrc               rc6.d               w3m
console-tools         fdmount.conf        ld.so.conf          mysql                rc.d                wgetrc
cron.d                fonts               locale.alias        nanorc               rcS.d               #wvdial.conf#
cron.daily            fstab               locale.gen          network              reportbug.conf      wvdial.conf
cron.hourly           groff               localtime           networks             resolvconf          wvdial.conf~
cron.monthly          group               logcheck            nsswitch.conf        resolv.conf         X11
crontab               group-              login.defs          ODBCDataSources      resolv.conf~        xpilot
cron.weekly           gshadow             logrotate.conf      odbc.ini             resolv.conf.pppd-backup
[/etc]$ []
```

The Terminal Emulator Connection

Terminal emulators work in the same way as their physical counterparts, the only difference is that there's no UART connection.
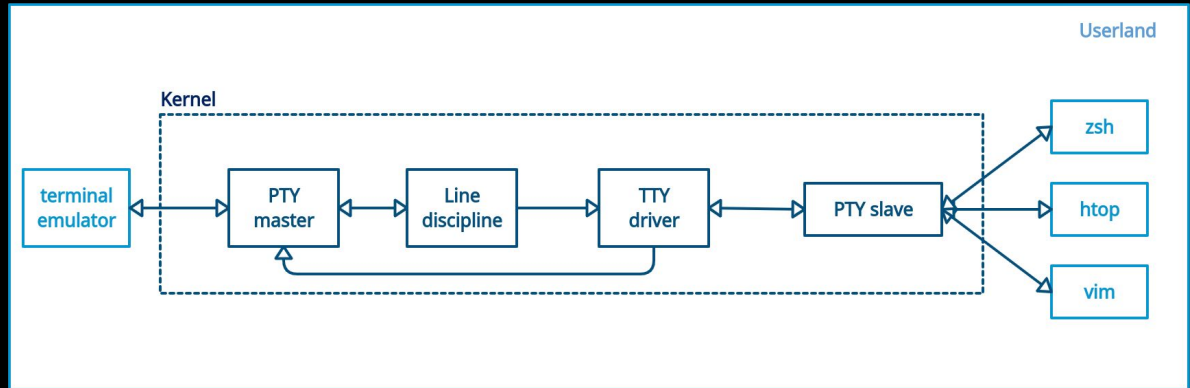
Pseudoterminals

- An improvement to the existing design
- Terminal emulation in userland, TTY subsystem in kernel

Pseudoterminals

A pseudoterminal is made up of two pseudo-devices:

- PTY Master
- PTY Slave

Codelab!

Thank you!

References:

➔ The TTY demystified by Linus Åkesson

➔ Linux terminals, tty, pty and shell by Nicola Apicella

➔ What is a TTY on Linux? (and How to Use the tty Command) by Dave McKay