

Writing Beautiful Command Line Programs

John Leach

@johnleach

June 2012

Text only interfaces

- Text user interfaces (TUI)
- Command line interfaces (CLI)

Lotus 1-2-3

A:A1: 'EMP MENU

Worksheet Range Copy Move File Print Graph Data System Quit
Global Insert Delete Column Erase Titles Window Status Page Hide

A	B	C	D	E	F	G	
1	EMP	EMP NAME	DEPTNO	JOB	YEARS	SALARY	BONUS
2	1777	Azibad	4000	Sales	2	40000	10000
3	81964	Brown	6000	Sales	3	45000	10000
4	40370	Burns	6000	Mgr	4	75000	25000
5	50706	Caesar	7000	Mgr	3	65000	25000
6	49692	Curly	3000	Mgr	5	65000	20000
7	34791	Dabarrett	7000	Sales	2	45000	10000
8	84984	Daniels	1000	President	8	150000	100000
9	59937	Dempsey	3000	Sales	3	40000	10000
10	51515	Donovan	3000	Sales	2	30000	5000
11	48338	Fields	4000	Mgr	5	70000	25000
12	91574	Fiklore	1000	Admin	8	35000	---
13	64596	Fine	5000	Mgr	3	75000	25000
14	13729	Green	1000	Mgr	5	90000	25000
15	55957	Hermann	4000	Sales	4	50000	10000
16	31619	Hodgedon	5000	Sales	2	40000	10000
17	1773	Howard	2000	Mgr	3	80000	25000
18	2165	Hugh	1000	Admin	5	30000	---
19	23907	Johnson	1000	VP	1	100000	50000
20	7166	Laflare	2000	Sales	2	35000	5000

DATA MK2

Microsoft Word 5.5

The screenshot shows the Microsoft Word 5.5 interface. The menu bar includes File, Edit, View, Insert, Format, Utilities, Macro, Window, and Help. The title bar reads 'Document1'. The main window displays the text: 'This is Microsoft Word 5.5...' and 'It is running on a 386 with 2MB of RAM'. A dialog box titled 'About Microsoft Word' is open, containing the following text: 'Microsoft Word 5.5', 'Copyright 1983-1990 Microsoft Corporation', 'All rights reserved.', 'This product is licensed to:', 'MATROBRIVA', and 'Serial Number: 00-035-0550-'. The dialog box has an 'OK' button. The status bar at the bottom shows 'Pg1 Co39', '{}', '<F1=Help>', and 'Microsoft Word'. A teal banner at the bottom of the window reads 'Displays Word version number and copyright'.

```

File Edit View Insert Format Utilities Macro Window Help
Document1
This is Microsoft Word 5.5...
It is running on a 386 with 2MB of RAM

About Microsoft Word

Microsoft Word 5.5
Copyright 1983-1990 Microsoft Corporation
All rights reserved.

This product is licensed to:
MATROBRIVA
Serial Number: 00-035-0550-

< OK >

Pg1 Co39 {} <F1=Help> Microsoft Word
Displays Word version number and copyright
  
```

make menuconfig

```

.config - Linux Kernel v2.6.32 Configuration
Linux Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus --->.
Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes,
<M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </>
for Search. Legend: [*] built-in [ ] excluded <M> module < >

| General setup --->
[*] Enable loadable module support --->
-- Enable the block layer --->
  Processor type and features --->
  Power management and ACPI options --->
  Bus options (PCI etc.) --->
  Executable file formats / Emulations --->
-- Networking support --->
  Device Drivers --->
  Firmware Drivers --->
  File systems --->
v(*)

<Select>  < Exit >  < Help >

```

shell

```
$ uptime
12:59:52 up 16 days,  1:53,  1 user,  load average: 0.87, 0.66, 0.70

$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda2      75G   64G   7.1G  90% /

$ ping -c1 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_req=1 ttl=49 time=163 ms

— 8.8.8.8 ping statistics —
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 163.747/163.747/163.747/0.000 ms
```

Brightbox Cloud API

```
$ brightbox-servers list
```

id	status	type	zone	created_on	image_id	cloud_ip_ids	name
srv-f7dye	active	nano	gb1-b	2010-12-03	img-9vxqi	cip-8ks0v	tor1
srv-v4rjq	active	mini	gb1-b	2011-01-22	img-9vxqi	cip-ye4ue	ququ-web
srv-uicfm	active	small	gb1-a	2011-05-08	img-2ab98	cip-46qrn	newsniffer
srv-veehc	active	small	gb1-a	2011-06-05	img-4gqhs	cip-tqg43	web1
srv-crpty	active	nano	gb1-a	2011-08-06	img-4gqhs	cip-m1e98	humanweb
srv-98rr6	active	nano	gb1-a	2011-11-25	img-3fsuy	cip-8u19j	claw
srv-8hecw	active	mini	gb1-a	2012-02-23	img-ytx00	cip-zd2me	mycogen
srv-aae27	inactive	mini	gb1-a	2012-04-11	img-715uq		debiantest
srv-qulcn	active	nano	gb1-b	2012-05-09	img-9h5cv		apacheds test
srv-aa5jn	active	nano	gb1-a	2012-05-09	img-9h5cv		amq

Input and Output

- `stdin`: text typed at a keyboard
- `stdout`: text emitted by the program
- `stderr`: more text emitted by the program

stdin, stdout, stderr in Ruby

```
puts STDIN.inspect
```

```
#<IO:0x7f353af81a08>
```

```
puts STDOUT.inspect
```

```
#<IO:0x7f0b08eb09f0>
```

```
puts STDERR.inspect
```

```
#<IO:0x7ff7e60df9b8>
```

stdin and stdout in Ruby

```
echo "hello" | ruby -e 'puts STDIN.read'
```

```
hello
```

```
STDOUT.puts "world"
```

```
world
```

ls to your terminal

```
$ ls .  
cmd  
completion.rb  
context.rb  
ext  
extend-command.rb  
frame.rb  
help.rb  
init.rb  
input-method.rb  
lc  
locale.rb  
notifier.rb  
output-method.rb  
ruby-lex.rb  
ruby-token.rb  
slex.rb  
version.rb  
workspace.rb  
ws-for-case-2.rb  
xmp.rb
```

ls to another program

```
$ ls . | grep ruby  
ruby-lex.rb  
ruby-token.rb
```

Is errors go where?

```
$ ls . _why | grep ruby
ls: cannot access _why: No such file or directory
ruby-lex.rb
ruby-token.rb
```

ls errors go to stderr

```
$ ls . _why 2>error.log | grep ruby  
ruby-lex.rb  
ruby-token.rb
```

```
$ cat error.log  
ls: cannot access _why: No such file or directory
```

ls for humans

```
$ ls  
cmd  
completion.rb  
context.rb  
ext  
extend-command.rb  
frame.rb  
help.rb  
init.rb  
input-method.rb  
lc  
locale.rb  
notifier.rb  
output-method.rb  
ruby-lex.rb  
ruby-token.rb  
slex.rb  
version.rb  
workspace.rb  
ws-for-case-2.rb  
xmp.rb
```

ls for programs

```
$ ls . | grep ruby  
ruby-lex.rb  
ruby-token.rb
```


ls knows when you're not human

```
$ ls | cat  
cmd  
completion.rb  
context.rb  
ext  
extend-command.rb  
frame.rb  
help.rb  
init.rb  
input-method.rb  
lc  
locale.rb  
notifier.rb
```

ls in for loops

```
$ for f in 'ls'; do  
> echo Doing something with $f  
> done  
Doing something with cmd  
Doing something with completion.rb  
Doing something with context.rb  
Doing something with ext  
Doing something with extend-command.rb  
Doing something with frame.rb
```

Detecting humans

```
$ ruby -e 'puts STDIN.isatty.inspect'  
true
```

```
$ echo hello | ruby -e 'puts STDIN.isatty.inspect'  
false
```

Terminal width

- 80 characters
- detect and adapt

```
irb(main):001:0 > ENV[ 'COLUMNS' ]
```

```
=> "80"
```

```
irb(main):002:0 > ENV[ 'LINES' ]
```

```
=> "24"
```

```
$ stty size
```

```
24 80
```

Use of colour

- ls
- grep
- only if a tty

Drawing nice tables with Hirb

```
table [Time.now, Time.now + 3600], :fields => [[:to_s, :to_i]
```

```
+-----+-----+
| to_s                | to_i                |
+-----+-----+
| Wed Jun 27 10:26:57 +0100 2012 | 1340789217 |
| Wed Jun 27 11:26:57 +0100 2012 | 1340792817 |
+-----+-----+
2 rows in set
```

Vertical tables

```
table [Time.now, Time.now + 3600], :fields => [[:to_s, :to_i],  
       :vertical => true
```

```
***** 1. row *****  
to_s: Wed Jun 27 11:04:21 +0100 2012  
to_i: 1340791461  
***** 2. row *****  
to_s: Wed Jun 27 12:04:21 +0100 2012  
to_i: 1340795061  
2 rows in set
```

Hirb::Table vs. Brightbox::SimpleTable

- Brightbox::SimpleTable

```

to_s                                to_i
-----
Wed Jun 27 11:17:04 +0100 2012  1340792224
Wed Jun 27 12:17:04 +0100 2012  1340795824
-----

```

- Hirb::Table

```

+-----+-----+
| to_s                | to_i                |
+-----+-----+
| Wed Jun 27 10:26:57 +0100 2012 | 1340789217 |
| Wed Jun 27 11:26:57 +0100 2012 | 1340792817 |
+-----+-----+
2 rows in set

```


Whitespace and awk

```
echo "hello  world" | awk '{print $2}'
```

```
world
```

```
echo "hello | world" | awk '{print $2}'
```

```
|
```

```
echo "hello | world" | awk -F'|' '{print $2}'
```

```
world
```

Awk and xargs in action

```
$ brightbox-servers list | grep inactive |
> awk '{print $1}' | xargs brightbox-servers show
      id: srv-aae27
      status: inactive
      name: debiantest
      created_at: 2012-04-11T20:27Z
      deleted_at:
      zone: gb1-a
      type: typ-iqisj
      type_name: Brightbox Mini Instance
      type_handle: mini
      ram: 1024
      cores: 4
      disk: 40960
      private_ips: 10.240.160.222
      cloud_ips:
      ipv6_address: 2a02:1348:14c:2837:24:19ff:fef0:a0de
      cloud_ip_ids:
      hostname: srv-aae27
public_hostname:
      ipv6_hostname: ipv6.srv-aae27.gb1.brightbox.com
      snapshots:
      server_groups: grp-98v4n
```

Whitespace and the mouse

If a mouse clicks and your program isn't listening for it, does it do anything?

command line arguments

- ARGV

```
ruby -e 'puts ARGV.inspect' -- -a hello -b world
```

```
["-a", "hello", "-b", "world"]
```

command line arguments

- Long form and short form
- Commonly used options (-h, -v)
- -f - for stdin
- OptionParser
- GLI

environment variables

- No parsing needed! Secure!

```
MSG="hello_world" ruby -e 'puts ENV["MSG"]'
```

```
hello world
```

Config file specification

- plain text
- line orientated
- support comments

config file formats

- noxml
- = separated key values
- ini if you need sections
- yaml isn't too bad

XDG Base Directory Specification

- data goes in `~/.local/share/yourapp`
- config goes in `~/.config/yourapp`
- non-essential data goes in `~/.cache/yourapp`

auto-setup

- create the directories you need automatically
- if you need a config, provide a tool to create one

Auto-completion

- Typing is error prone and noisy
- Remembering long options is hard
- hyphens and whitespace

brightbox commands

```
$ brightbox
```

```
brightbox
```

```
brightbox--accounts
```

```
brightbox--cloudips
```

```
brightbox--config
```

```
brightbox--firewall--policies
```

```
brightbox--firewall--rules
```

```
brightbox--groups
```

```
brightbox--images
```

```
brightbox--lbs
```

```
brightbox--servers
```

```
brightbox--types
```

```
brightbox--users
```

```
brightbox--zones
```

```
$ brightbox--firewall--
```

```
brightbox--firewall--policies
```

```
brightbox--firewall--rules
```

brightbox-firewall-rules

```
$ brightbox-firewall-rules
create      destroy    help      list      show
```

```
$ brightbox-firewall-rules create --
--destination  --icmptype    --source
--dport        --protocol    --sport
```

```
$ brightbox-firewall-rules create --source=any fwp-
fwp-fx45z      fwp-ln6wh     fwp-qhdkl     fwp-uba8q
fwp-gasvb      fwp-lz4ro     fwp-qlrl5     fwp-w9fl8
fwp-gtock      fwp-mcxy6     fwp-rgjt5     fwp-x572u
```

Documentation

- basic inline `-help`
- man pages
- a page for each command
- info pages

man page

GREP(1)

NAME

grep, egrep, fgrep, rgrep - print lines matching a pattern

SYNOPSIS

```
grep [OPTIONS] PATTERN [FILE...]  
grep [OPTIONS] [-e PATTERN | -f FILE] [FILE...]
```

DESCRIPTION

grep searches the named input FILES (or standard input) for lines matching PATTERN. If FILE is named, or if a single hyphen-minus (-) is given as file name, the standard input is used. If FILE contains a match to the given PATTERN. By default, only matching lines.

In addition, three variant programs `egrep`, `fgrep`

Prompting the user

- user isn't always a human!
- `-force`

Return Codes

Packaging

- deb/rpm
- gem
- gem2deb

Summary

Writing Beautiful Command Line Programs

- @johnleach
- john@johnleach.co.uk
- <http://johnleach.co.uk>
- <http://brightbox.com>