

Data Science - Basics

Lecture 02 - Shell

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Institute for Computer Science – Campus Institute for Data Science (CIDAS)

```
/home/mars
 ers@marsmain " $ cd /usr/portage/app-shells/bash
 ars@marsmain /usr/oortage/app-shells/bash $ is -al
total 138
drwxr-xr-x 3 portage portage 1024 Jul 25 10:06
drwxr-xr-x 33 portage portage 1824 Aug 7 22:39
                             35808 Jul 25 10:06 ChangeLog
                             27002 Jul 25 10:06 Manifest
rw-r--r-- 1 portage portage 4645 Mar 23 21:37 bash-3.1_p17.ebuild
             portage portage 5977 Mar 23 21:37 bash-3.2.p39.ebuild
rw-r--r-- 1 portage portage 6151 Apr 5 14:37 bash-3.2 p48-r1.ebuild
ru-r--r-- 1 portage portage 5988 Mar 23 21:37 bash-3.2 p48 ebuild
rw-r--r-- 1 portage portage 5643 Apr 5 14:37 bash-4.0 p10-r1.ebuild
rw-r--r-- 1 portage portage 6230 Apr 5 14:37 bash-4.0 p10.ebuild
ru-r--r-- 1 portage portage 5648 Apr 14 85:52 bash-4.0 p17-r1 ebuild
rw-r--r-- 1 portage portage 5532 Apr 8 10:21 bash-4.0_p17.ebuild
ru-r--r-- 1 portage portage 5660 May 30 03:35 bash-4.0 p24.ebuild
                              5668 Jul 25 89:43 bash-4.8 p28.ebuild
hwxr-xr-x 2 portage portage 2048 May 30 03:35
ru-r--r-- 1 portage portage 468 Feb 9 84:35 metadata.xml
                               hells/bash $ cat metadata.yml
 ?xml version="1.8" encoding="UTF-8"?)
!DDCTYPE_pkgmetadata_SYSTED_"http://www.gentog.org/dtd/metadata.dtd">
(okometadata)
(herd>base-sustem</herd>
 <flag name='bashlogger'>Log ALL commands tuped into bash; should ONLY be
  used in restricted environments such as honeupots</flag>
 <flag name='net'>Enable /dev/ton/host/nort redirection</flag>
 (Tiau name= piugins >Nog support for ipaging pulitins at runtime via
    'enable' </flag:
 ers@marsmain /usr/portage/app-shells/bash $ sudo /etc/init.d/bluetooth status
assword:
status: started
 ars@marsmain /usr/portage/app-shells/bash $ ping -q -c1 en.wikipedia.org
PING rr.esams.wikimedia.org (91.198.174.2) 56(84) butes of data.
-- rr.esams.wikimedia.org ping statistics ---
 packets transmitted, 1 received, 8% packet loss, time 2ms
tt min/avg/max/mdev = 49.828/49.828/49.828/8.888 ms
 ars@marsmain /usr/portage/app-shells/bash $ grep -i /dev/sda /etc/fstab | cut --fields=-
/dev/sda1
dev/sda2
dev/sda3
 rs@marsmain /usr/portage/app-shells/bash $ date
Sat Aug 8 02:42:24 MSD 2009
 ars@marsmain /usr/portage/app—shells/bash $ 1smod
todule:
                       Size Used bu
rodis wlan
                      23424 8
                       8696 1 rndis wlan
                       5672 1 rndis host
dc ether
usbnet
                      18688 3 rndis wlan, rndis host, cdc ether
                      38424 0
parport pc
                    2388128 28
                      39648 1 parmort no
```

12272 0

2c_1801 9380 0 ars@marsmain /usr/portage/app—shells/bash \$ ■

iTCO_wdt i2c_i801 Data Exploration with Bash (Unix

Shell)

Unix Shell



- A Unix shell is a command line interpreter that provides an interface to Unix-like operating systems (Linux, MacOS)
- Windows now provides a similar tool with the PowerShell
- It can be used as an interactive command language
- It can be used as a scripting language

```
rs@narsmain " $ cd /usr/nortage/ann-shells/hash
  s@marsmain /usr/portage/app-shells/bash $ is -al
rwxr-xr-x 3 portage portage 1024 Jul 25 10:06
 wxr-xr-x 33 portage portage
                             1024 Aug 7 22:39
                              5660 May 30 03:35 bash-4.0_p24.ebuild
          2 portage portage 2848 May 38 83:35 file
          1 portage portage 468 Feb 9 84:35 metadata.xml
7xml version="1.0" encoding="UTF-8"?>
|DOCTYPE_pkgmetadata_SYSTEM_"http://www.gentop.org/dtd/metadata.dtd")
(nkometadata)
herd>base-sustem</herd>
 <flag name='bashlogger'>Log ALL commands tuped into bash; should ONLY be
  used in restricted environments such as honeupots</flag>
 <flag name='net'>Enable /dev/tcp/host/port redirection</flag
 <flag name='plugins'>Add support for loading builtins at runtime via
   'enable' </flag>
  s@marsmain /usr/portage/app-shells/bash $ sudo /etc/init.d/bluetooth status
assword:
status; started
 s@marsmain_/usr/portage/app-shells/bash $ ping -q -c1 en.wikipedia.org
ING rr.esams.wikimedia.org (91.198.174.2) 56(84) butes of data
--- rr.esams.wikimedia.org ping statistics ---
packets transmitted, 1 received, 8% packet loss, time 2ms
tt min/avg/max/mdev = 49.820/49.820/49.820/0.800 ms
ers@marsmain /usr/portage/app-shells/hash & grep -i /dev/sda /etc/fstab | cut --fields:
dev/sda1
                      none
    marsmain /usr/portage/app-shells/bash $ date
at Aug 8 02:42:24 MSD 2009
ars@marsmain /usr/portage/app-shells/bash $ 1smod
                      Size Used by
ndis wlan
                      23424 8
ndis bost
                      8696 1 rndis_wlan
                      5672 1 rndis host
                      18688 3 rodis wlan rodis host odo ether
```

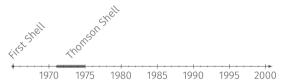
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2388128 28

arport po

Shell - History



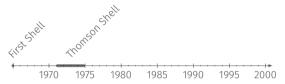


- First first command-line user interface shell developed by Glenda Schroeder at MIT
- Modelled after the RUNCOM program by Louis Pouzin
- For the Multics operating system.



Shell - History





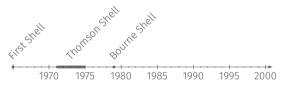
- First Unix shell developed by Ken Thompson for Unix 1-6 at Bell labs
- He also invented B, the direct predecessor of C
- He worked at Google where he co-developed the Go programming language.
- He worked on regular expressions
- He provided the definition of UTF-8 encoding
- He won the Turing award ("Nobel prize" of computer science)



[https://en.wikipedia.org/wiki/Ken_Thompson]

Shell – History





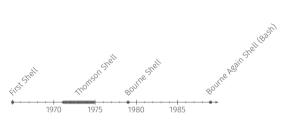
- Developed by Stephen Bourne for Unix 7 at Bell labs
- Introduced basic features common to all other shells
- Bash is based on the Bourne shell



[https://en.wikipedia.org/wiki/Stephen_R._Bourne]

Shell - History





- Developed by Brian Fox for the GNU Project as a free replacement for the Bourne shell
- Is used as default login shell for most Linux distributions
- Used in macOS until Catalina (now zsh is used)



Why use a shell?



- Gives you immediate access to your operating system
- Good to explore and preprocess data
- Good for automating simple jobs and immediate interactions
- Faster than clicking
- Can be used remotely (on servers and clusters)
- Has many powerful and fast tools that allow you to automate many jobs
- Has a large online community

```
rs@narsnain " & cd /usr/portage/app-shells/bash
 rs@narsmain /usr/nortage/app-shells/bash & ls -al
inwor-xr-x 3 portage portage 1824 Jul 25 18:80
rwxr-xr-x 33 portage portage 1024 Aug 7 22:39
                           35888 Jul 25 10:06 ChangeLog
                           27882 Jul 25 18:86 Nanifest
            portage portage 4645 Mar 23 21:37 hash-3 1 p17 ebuild
                             5977 Mar 23 21:37 bash-3,2_p39.ebuild
                             6151 Apr 5 14:37 bash-3,2.p48-r1.ebuild
                             5988 Mar. 23 21:37 hash-3.2 p48 ehuild
                             5643 Apr 5 14:37 bash-4.0_p10-r1.ebuild
                             6239 Bpc 5 14:37 bash-4.8 p18 ebuild
                             5648 Apr 14 05:52 bash-4.0 p17-r1.ebuild
                             5532 Apr. 8 18:21 bash-4 8 p17 ebuild
                             5660 May 30 03:35 bash-4.0 p24.ebuild
                             5669 Jul 25 89:43 bash-4 8 n28 ebuild
          2 portage portage 2848 May 38 83:35
          1 portage portage 468 Feb 9 84:35 metadata val
xml version="1.0" encoding="UTF-8"?>
DOCTYPE prometadata SYSTEM "http://www.gentop.org/dtd/netadata.dtd";
herd/hase-susten</herd>
<flag name='bashlogger'>Log ALL commands typed into bash; should ONLY be
  used in restricted environments such as honeupots</flag>
 cflan name='net'>Enable /dev/ton/host/nort redirection</flan:</pre>
<flag name='plugins'>Add support for loading builtins at runtime via
visingraphin (usz/portage/app-shells/bash & sudo /etc/init.d/bluetooth status
yrs@narsnain /usr/cortage/app-shells/bash $ ping -g -c1 en.wikipedia.org
ING rr. esans wikinedia ora (91, 198, 174, 2) 56(84) butes of data.
 - rr.esams.wikimedia.org ping statistics ---
packets transmitted, 1 received, 8% packet loss, time 2ms
t min/avo/may/mdey = 49,828/49,828/49,828/8,828/8,888 ms
x sinar spain /usz /oor tage /oop-shells /pash 8 grep -i /dev/sda /etc/fstab | cut --fields=-3
rs@parspain /usr/portage/app-shells/bash & date
iat Aug 8 02:42:24 MSD 2009
                      Size Used bu
ndis wlan
                     23424 8
                      8696 1 rndis wlan
                      5672 1 rndis_host
                     18688 3 rndis wlan, rndis host, odo ether
arport_po
                      38424 8
                   2388128 28
                     39648 1 parport pc
                     12272 8
                      9380 0
ars@narsmain /usr/oortage/app-shells/bash $ |
```

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How to be fast with a shell

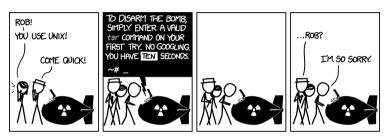


- Use TAB (key at the left side of your keyboard) for completing commands.
- The completion is pretty smart
- This saves typing time and effort to remember files/commands exactly
- You can make Unix/Linux users really nervous by not using it.

```
rs@narsnain " & cd /usr/portage/app-shells/bash
  rs@narsmain /usr/nortage/app-shells/bash & ls -al
inwor-xr-x 3 portage portage 1824 Jul 25 18:80
rwxr-xr-x 33 portage portage 1024 Aug 7 22:39
                                                           35888 Jul 25 18:86 ChangeLog
                                                        27882 Jul 25 18:86 Nanifest
                         portage portage 4645 Mar 23 21:37 hash-3 1 p17 ebuild
                                                            5977 Mar 23 21:37 bash-3,2_p39.ebuild
                                                             6151 Apr 5 14:37 bash-3,2.p48-r1.ebuild
                                                             5988 Mar. 23 21:37 hash-3.2 p48 ehuild
                                                             5643 Apr 5 14:37 bash-4.0_p10-r1.ebuild
                                                            6239 Bpc 5 14:37 bash-4.8 p18 ebuild
                                                             5648 Apr 14 05:52 bash-4.0 p17-r1.ebuild
                                                             5532 Apr. 8 18:21 bash-4 8 p17 ebuild
                                                             5660 May 30 03:35 bash-4.0 p24.ebuild
                                                             5660 Jul 25 09:43 bash-4.0_p28.ebuild
                      2 portage portage 2048 May 30 03:35
                                                             468 Feb. 9 84:35 netadata val
 xml version="1.0" encoding="UTF-8"?>
 DOCTYPE prometadata SYSTEM "http://www.gentop.org/dtd/netadata.dtd";
herd/hase-susten</herd>
 <flag name='bashlogger'>Log ALL commands typed into bash; should ONLY be
     used in restricted environments such as honeupots</flag>
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 <flag name='plugins'>Add support for loading builtins at runtime via
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 yrs@narsnain /usr/cortage/app-shells/bash $ ping -g -c1 en.wikipedia.org
 NG rr. esags wikinedia org (91,198,174.2) 56(84) butes of data.
  - rr.esams.wikimedia.org ping statistics ---
 packets transmitted, 1 received, 8% packet loss, time 2ms
 t min/avo/may/mdey = 49,828/49,828/49,828/8,828/8,888 ms
  rssparsmain /usr/portage/app-shells/pash & grep -i /dev/sda /etc/fstab | cut --fields=-3
 rs@parspain /usr/portage/app-shells/bash & date
iat Aug 8 02:42:24 MSD 2009
                                             Size Used bu
ndis wlan
                                            23424 8
                                             8696 1 rndis wlan
                                             5672 1 rndis_host
                                            18688 3 rndis wlan, rndis host, odo ether
arport_po
                                             38424 8
                                        2388128 28
                                            39648 1 parport pc
                                           12272 8
                                             9380 0
ars@marsmain /usr/portage/app-shells/bash $ |
```

What todays lecture is and what it is not





[https://xkcd.com/1168/]

- It shows you a few examples and how to get around
- Introduction to the most important commands
- It is not a comprehensive treatment of all commands and capabilities.

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To the notebook

(fire up your shells)





- htop
- watch date
- CTRL-C, CTRL-D, CTRL-Z + bg

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TMUX (Terminal Multiplexer)



- tmux
- Split pane: C-b %, C-b left/right
- New window: C-b c, C-b p, C-b n, C-b < number>
- Detach: C-b d
- Attach: tmux ls, tmux attach -t 0

[https://www.hamvocke.com/blog/a-quick-and-easy-guide-to-tmux/]

That's it. Questions?