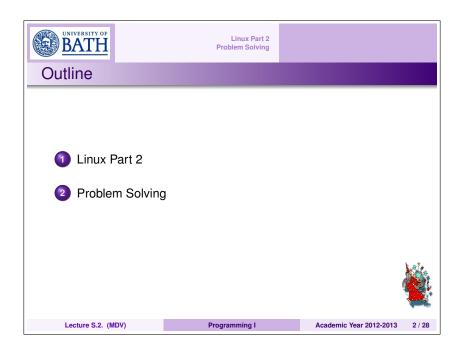


Academic Year 2012-2013







Pipes Environment Variables Some More Tools

Previous Commands

pwd	rm	cat
ls	chmod	whoami
cd	wc	passwd
mkdir	more	users
ср	less	groups
mv	diff	



Academic Year 2012-2013



Linux Part 2

Redirecting IO

Some More Tools

Redirecting Input and Output

- A running program is called a process
 - By default, every process has three connections to the outside world:
 - Standard input (stdin): connected to the keyboard
 - Standard output (stdout): connected to the screen
 - Standard error (stderr): also connected to the screen (Used for error messages)



Lecture S.2. (MDV)

Academic Year 2012-2013 6 / 28



Linux Part 2 **Problem Solving**

Redirecting IO

Environment Variables
Some More Tools

Redirecting Input and Output II

You can tell the shell to connect standard input and standard output to files instead

- command < inputFile reads from inputFile instead of from the keyboard
 - Don't need to use this very often, because most Unix commands let you specify the input file (or files) as command-line arguments
- command > outputFile writes to outputFile instead of to the
 - Only normal output goes to the file, not error messages
- command < inputFile > outputFile does both





Redirecting IO

Pipes
Environment Variables
Some More Tools

Redirecting Input and Output III

• Example: save number of words in all text files to words.len

\section \se

• Nothing appears, because output is being sent to the file words.len

```
\$ Is -t
words.len
txt
\$ cat words.len
9 earth.txt
9 venus.txt
12 words.len
30 total
                                                          venus.txt
```

Try typing cat > junk.txt

- No input file specified, so cat reads from the keyboard
- Output sent to a file
- Voila: the world's dumbest text editor

Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013



Linux Part 2

Redirecting IO ment Variables Some More Tools

Pipes I

- Suppose you want to use the output of one program as the input of another
 - \bullet E.g., use wc -w *.* to count the words in some files, then sort -n to sort numerically
- Option 1: send output of first command to a temporary file, then read from that file

```
wc *.txt > temp
\verb|sort| -n < temp|
```



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013 9 / 28



Linux Part 2 **Problem Solving**

Redirecting IO **Environment Variables Some More Tools**

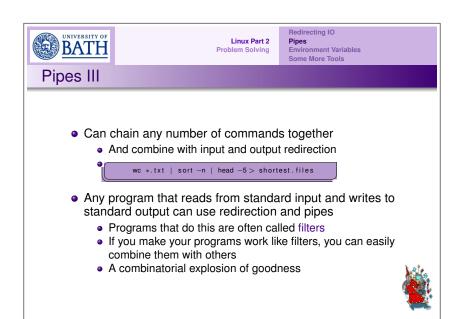
Pipes II

- Option 2: use a pipe to connect the two programs
 - Written as "|'
 - Tells the operating system to send what the first program writes to its stdout to the second program's stdin

sort -n wc -w *.* 9 earth.txt 9 venus.txt 12 words.len 30 total

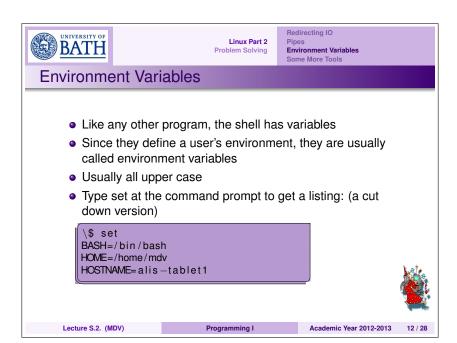
 More convenient (and much less error prone) than temporary files

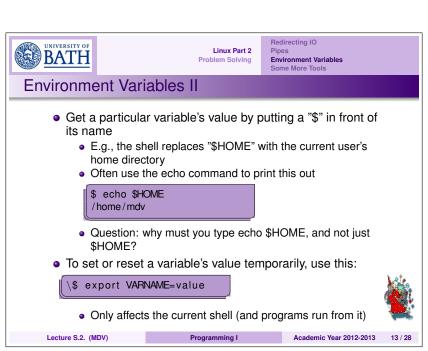




Academic Year 2012-2013

Lecture S.2. (MDV)





Environment Variables III

BATH

- To set a variable's value automatically when you log in, set it in /.bashrc
 - Remember, " " is a shortcut meaning your home directory



Lecture S.2. (MDV

Programming I

Academic Year 2012-2013

14 / 28



Linux Part 2
Problem Solving

Redirecting IO
Pipes
Environment Variables
Some More Tools

Environment Variables IV

Name	Typical Value	Notes
DISPLAY	0:0	The display variable used for X11 graphics.
HOME	/home/mdv	The current user's home directory
HOMEDRIVE	C:	The current user's home drive (Windows only)
HOSTNAME	"alis-tablet"	This computer's name
HOSTTYPE	"i486"	What kind of computer this is
OSTYPE	"linnux-gnu"	What operating system is running
PATH	"/usr/local/sbin: /usr/local/bin: /usr/sbin:/usr/bin: /sbin:/bin:/usr/bin/X11: /usr/games"	Where to look for programs
PWD	/home/mdv/Desktop/	Present working directory
SHELL	/bin/bash	What shell is being run
TEMP	/tmp	Where to store temporary files
USER	"mdv"	The current user's ID



Lecture S.2. (MDV)

Linux Part 2 Problem Solving

Programming I

Redirecting IO
Pipes
Environment Variables
Some More Tools

Academic Year 2012-2013 15 / 28

How the Shell Finds Programs

- The most important of these variables is PATH
 - The search path that tells the shell where to look for programs
 - When you type a command like tabulate, the shell:
 - Splits \$PATH on colons to get a list of directories
 - Looks for the program in each directory, in left-to-right order
 - Runs the first one that it finds
- Example
 - PATH is /home/mdv/bin:/usr/local/bin:/usr/bin:/Python24
 - Both /usr/local/bin/tabulate and /home/mdv/bin/tabulate exist
 - /home/mdv/bin/tabulate will be run when you type tabulate at the command prompt
 - Can run the other one by specifying the path, instead of just the command name



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013

16 / 28



Redirecting IO Environment Variables
Some More Tools

How the Shell Finds Program

- Warning: it is common to include . in your path
 - This allows you to run a program in the current directory just by typing whatever, instead of ./whatever
 - But it also means you can never be quite sure what program a command will invoke
 - Though you can use the command which program_name, which will tell you
- Common entries in PATH include:
 - /bin, /usr/bin: core tools like Is (Note: the word bin comes from binary, which is geekspeak for a compiled program)
 - /usr/local/bin: optional (but common) tools, like the gcc
 - \$HOME/bin: tools you have built for yourself



Lecture S.2. (MDV) Programming I Academic Year 2012-2013



Basic Tools I

Linux Part 2

Redirecting IO Some More Tools

man	Documentation for commands.
cat	Concatenate and display text files.
cd	Change working directory.
chmod	Change file and directory permissions.
clear	Clear the screen.
ср	Copy files and directories.
date	Display the current date and time.
diff	Show differences between two text files.
echo	Print arguments.
env	Show environment variables.
head	Display the first few lines of a file.
Is	List files and directories.
mkdir	Make directories.



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013



Linux Part 2 **Problem Solving**

Redirecting IO Pipes Environment Variables Some More Tools

Basic Tools II

Page through a text file.
Move (rename) files and directories.
Display the bytes in a file.
Change your password.
Print current working directory.
Remove files.
Remove directories.
Sort lines.
Display the last few lines of a file.
Remove duplicate lines.
Count lines, words, and characters in a file.
locate a command





Redirecting IO
Pipes
Environment Variat
Some More Tools

Compressing and Decompressing

- If large files have to be stored, emailed or transported, it is easier to compress them, making the file size smaller.
- When needed later they can be restored or decompressed
- A variety of compressing/decompressing algorithms exists.
- A simple example: the sequence "aaaaa" could for example be represented more compactly as "5a"
- The most common in linux systems are "gzip gunzip","bzip2 - bunzip2" and "zip", which gives you the extensions ".gz",".bz2",".zip"



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013

20 / 28



Linux Part 2

Pipes Environment Variables Some More Tools

Redirecting IO

Creating Archives

- For storing purposes, emailing or transporting a number of files, it is sometimes more convenient to be able to bundle all these files together as one big file. Such a file is called an archive
- In linux we use a program called "tar", so we call those archives tarfiles.
- Format: tar -flags pathname [pathname]

c create an archive
x extract an archive
t display what is an archive

Common flags:

v verbose, display the files being dealt with use filename for archive filter through gzip/gzunip filter through bzip2/bunzip2



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013

21 / 28



Linux Part 2 Problem Solving Redirecting IO
Pipes
Environment Variables
Some More Tools

Creating Archives: Some examples

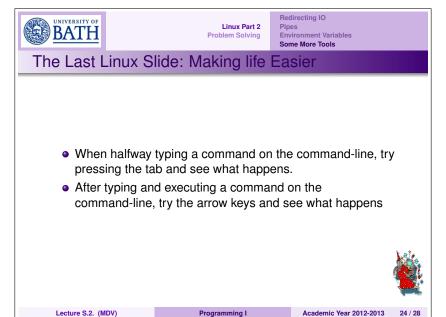
- tar —cvfz myfiles.tar.gz lectures/: creates an archive called myfiles.tar which is also being compressed using gzip and will include the directory lectures and all files that are in the directory lectures.
- tar -tvf myfiles.tar: this command will list all files that are stored in the archive myfiles.tar
- tar —xvfz myfiles.tar.gz: this will command will decompress
 the file myfiles.tar.gz and will then extract the archive in the
 current directory. This will result in a directory lectures
 being created (if this directory does not exist) where all the
 files of archive are going to be put.

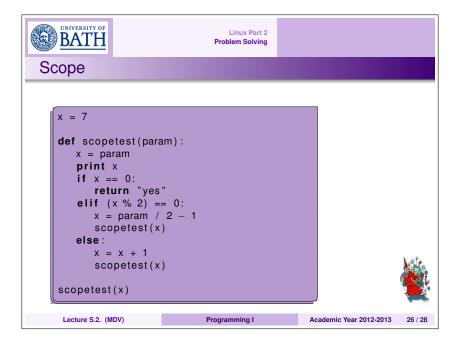




Lecture S.2. (MDV)

Academic Year 2012-2013







How would you start on these?

- Write a program that implements multiplication without using the use of *
- Write a program that finds all prime dividers of a given number
- Option has a module called random with a function random() providing random numbers between 0.0 and 1.0. How can you get numbers between 1 and 6 inclusive



Lecture S.2. (MDV)

Programming I

Academic Year 2012-2013

27 / 28



Linux Part 2
Problem Solving

And on these?

- Given an ordered tree containing numbers, how would you go about finding a given number?
- 4 How would you go about writing a program that implements the game of Yahtzee?
- Challenge! Global variables are not always a good idea. Everybody can access them. Suppose you want to limit access to a particular variables in such a way that can accessed in way you as a programmer intended.



Lecture S.2. (MDV)

Programming

Academic Year 2012-2013

28 / 28