Unix Shell Programming

Introduction
What is Unix

• Unix (pronounced you-nix) is an operating system typically used by academic and scientific researchers. The internet and Unix share a common background.

• Unix system provides an elegant and efficient ENVIRONMENT for program development.

• Dennis Ritchie and Ken Thompson developed Unix at Bell Laboratories in the late 1960s.
Unix Feature

- Unix system has its wide collection of programs. More than 200 basic COMMANDs are distributed with the standard operating system.
- The real strength of the Unix system comes from the elegance and ease with which the COMMANDs can be combined to perform far more sophisticated functions.
Unix Shell

• The SHELL is simply a program that reads in the COMMANDs you type and converts them into a form more readily understood by the Unix system. It also includes some fundamental programming constructs that let you make DECISION, LOOP, and store values in VARIABLES.

• To further its strength and to provide a consistent buffer between the user and the KERNEL of the Unix system.
Unix Shell Programming

• Because the shell offers an INTERPRETED programming language, programs can be written, modified, and debugged quickly and easily.

• Shell can be treated as our first choice of programming language.
A Quick Review of the Basics

FILE SYSTEM, BASIC COMMANDS, FILENAME SUBSTITUTION, I/O REDIRECTION, AND PIPES.
Some Basic Commands

- Displaying the Date and Time: The `date` Command
- Displaying the Calendar: The `cal` Command
- Finding out Who’s Logged In: The `who` Command and `who am i` (command argument)
- Displaying big version of word: The `banner` Command
- Echoing Characters: The `echo` Command
- Finding Help: The `man` Command
Working with Files

• The Unix system recognizes only three basic types of files: ordinary files, directory files, and special files.

• Ordinary file: any file on the system that contains data, text, program instructions, or just about anything else.

• Directory file: file

• Special file: special meaning to the Unix system and typically associated with some form of I/O.
Working with Files

• Listing Files: The ls Command and ls -a, ls -l
• File Types: The file Command
• Displaying the Contents of a File: The cat Command
• Counting the Number of Words in a File: The wc Command and wc -l, wc -c, wc –w
• Command Options
File System

A file system provides methods for managing data – how to enter data, where to put data, and how to use data. Common tasks such as report writing, programming, and analysis, generate electronic information that FILEs store. Storing groups of related files inside directories will better organize your data. Directories, are arranged in a hierarchical structure known as a DIRECTORY TREE. With Unix, very many directories may store other directories, and all may house their own files as well.
Just as English has an alphabet, so does Unix. The Unix alphabet is composed of the letters, numbers, and symbols you can type at a computer keyboard. More formally, Unix uses ASCII (American Standard Code for Information Interchange), which is a universally agreed upon set of numerical codes for a variety of characters. Extended ASCII uses 8 bits to store 256 characters.
Working with Files

• Making a Copy of a File: The cp Command
• Renaming a File: The mv Command
• Removing a File: The rm Command
Working with Directories

• The Home Directory and Pathnames

The Unix system always associates each user of the system with a particular directory. When you log in to the system, you are placed automatically into a directory called your HOME directory.

Whenever you are “inside” a particular directory (called your current working directory), the files contained within that directory are immediately accessible.

A pathname enables your to uniquely identify a particular file to the Unix system.

• Displaying Your Working Directory: The `pwd` Command
Working with Directories

• Changing Directories: The cd Command and . , ..
• More on the ls Command with file argument and directory argument.
• Creating a Directory: The mkdir Command
• Copying a File from One Directory to Another
• Moving Files Between Directories
Working with Directories

• Linking Files: The ln Command
  the ln command provides an easy way to give more than one name to a file. Most often, ln is used to link files between directories.
  the only stipulation on linking files is that for ordinary links, the files to be linked together must reside on the same file system.
• Removing a Directory: The rmdir Command and rmdir -r
Filename Substitution

- The Asterisk * matches zero or more characters
- Matching Single Characters: the question mark ? Matches exactly one character
  Another way to match a single character is to give a list of the characters to use in the match inside square brackets [ ].
## Filename Substitution Examples

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>echo a*</td>
<td>Print the <em>names</em> of the files beginning with a</td>
</tr>
<tr>
<td>cat *.c</td>
<td>Print all files ending in .c</td>
</tr>
<tr>
<td>rm <em>.</em></td>
<td>Remove all files containing a period</td>
</tr>
<tr>
<td>ls x*</td>
<td>List the names of all files beginning with x</td>
</tr>
<tr>
<td>rm *</td>
<td>Remove <em>all</em> files in the current directory (Note: Be careful when you use this.)</td>
</tr>
<tr>
<td>echo a*b</td>
<td>Print the names of all files beginning with a and ending with b</td>
</tr>
<tr>
<td>cp ../<em>.programs/</em> .</td>
<td>Copy all files from ../*.programs into the current directory</td>
</tr>
<tr>
<td>ls [a-z][!0-9]</td>
<td>List files that begin with a lowercase letter and don't end with a digit</td>
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</tbody>
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Standard Input/Output and I/O Redirection

• Standard Input and Standard Output

• Output Redirection( >, >> )

• Input Redirection( < )

• Pipes ( | )

• Filters

• Standard Error ( 2> )
Filters

• The term filter is often used in Unix terminology to refer to any program that can take input from standard input, perform some operation on that input, and write the results to standard output. More succinctly, a filter is any program that can be used between two other programs in a pipeline.

• `wc`, `cat` and `sort` are filters, whereas `who`, `date`, `cd`, `pwd`, `echo`, `rm`, `mv`, and `cp` are not.
Standard Error

In addition to standard input and standard output, there is another place known as standard error. This is where most Unix commands write their error messages. And as with the other two “standard” places, standard error is associate with your terminal by default. In most cases, you never know the difference between standard output and standard error.
More on Commands

• Compound Command: Typing more than one command on a line using “;”
• Sending a Command to the Background by ampersand character &
• The ps Command