Scripting & Interpreted Language

CSCI 4140: Open-Source Software Project Development

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http://course.cse.cuhk.edu.hk/~csci4140/

Two Sides of Web Programming

Client Side

- How to create requests?
  - Reload
  - Click hyperlinks
  - Submit forms
  - Send asynchronous requests
- How to manage display?
  - Dynamic update w/ DOM scripting
- How to manage client data?
  - Sessions / Cookies

Server Side

- How to generate responses?
  - Call CGI programs, can be written in any language
  - Mainstream: PHP, Python, Perl, Ruby, ASP, JSP, etc.
- How to manage application and user data?
  - Files
  - Databases

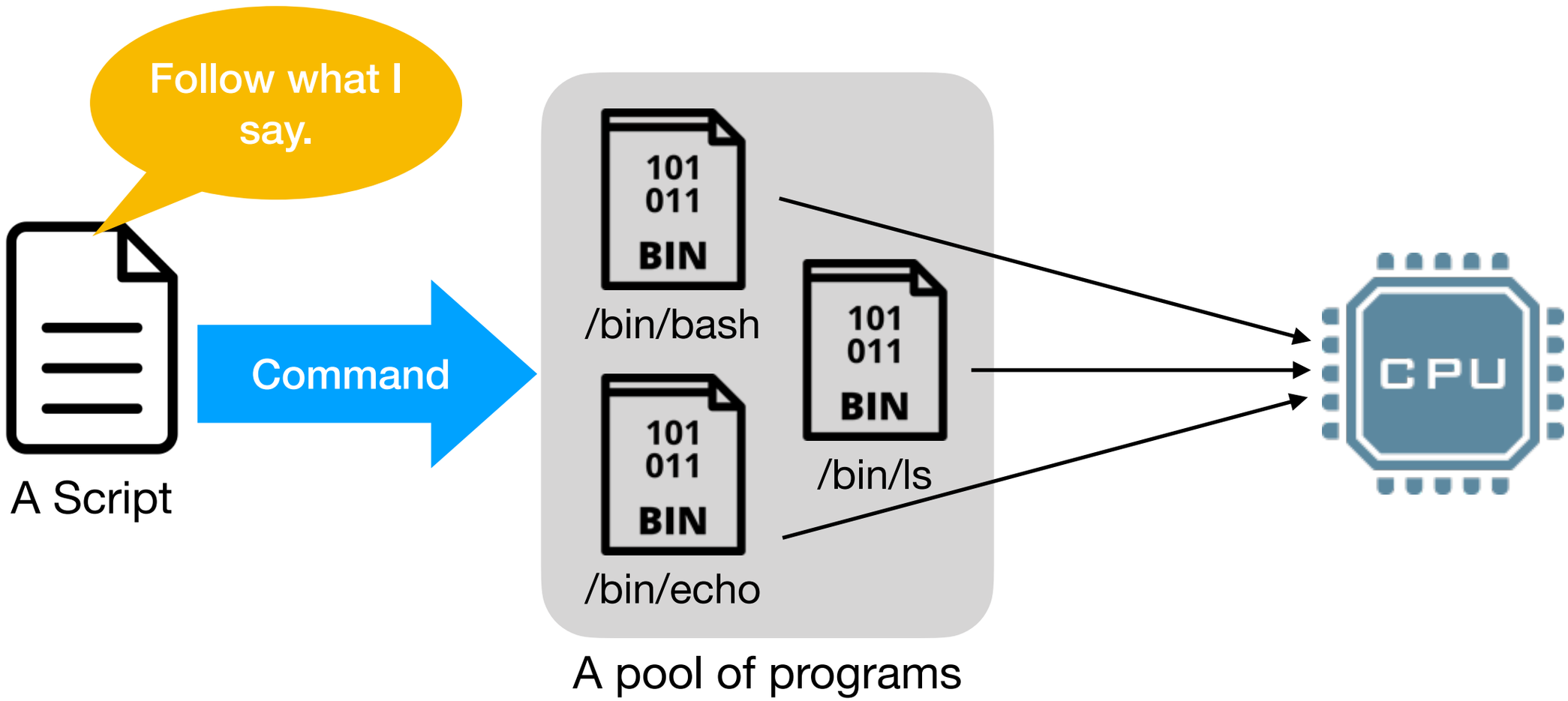
Our Focus

Compiled Programming Language

- We start learning programming with compiled languages like C, C++, Java, etc.
- Compiler: A software that translates program in one programming language into another programming language
- Executable: A file that causes a computer to perform predefined tasks encoded by instructions

Scripting Language

- So, what is a scripting language?



"A script is what you give the actors, but a program is what you give the audience." — Larry Wall (Creator of the Perl programming language)

Scripting Language (Cont.)

- A script
  - A sequence of tasks / orders / commands
  - Automate the execution of the tasks for a special run-time environment
  - Each task is processed by a program
- Scripting Language
  - Often interpreted (rather than compiled)
  - Sometimes referred as *very high-level programming languages*
  - Also used to refer *dynamic high-level general-purpose languages*, e.g., Perl and Python.

Scripting Language (Cont.)

- Environments that can be automated
  - Web browsers (ECMAScript, e.g, JavaScript)
  - OS (Bash)
  - Software applications (Visual Basic)
  - Games (Lua)
- What is an interpreter?
  - A computer program that executes instructions (commands) written in a programming language.
  - The instructions are not required to be compiled into machine language instructions.

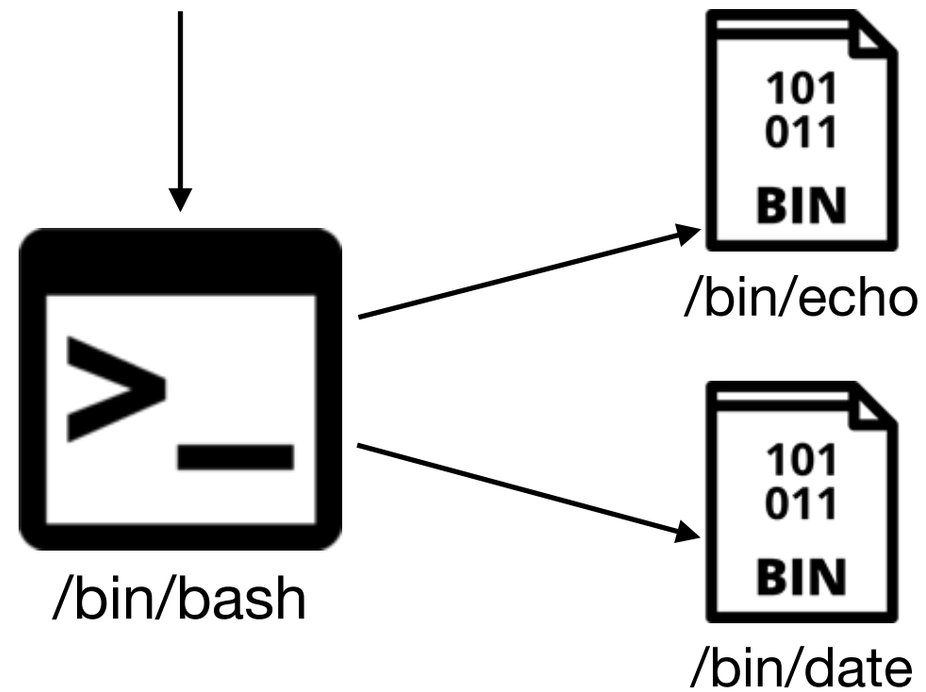
Bash

- Bash is a shell and scripting language for Unix-like Operating Systems

```
#!/bin/bash

echo "Hello World!"
date
```

A shell script



What is a Unix shell?

A command-line interpreter or a shell providing Unix-like command-line user interface

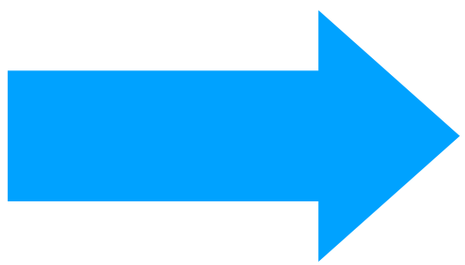
```
~ ❯❯❯ ./script.sh
Hello World!
Wed Jan 17 13:07:47 HKT 2018
~ ❯❯❯
```

Bash (Cont.)

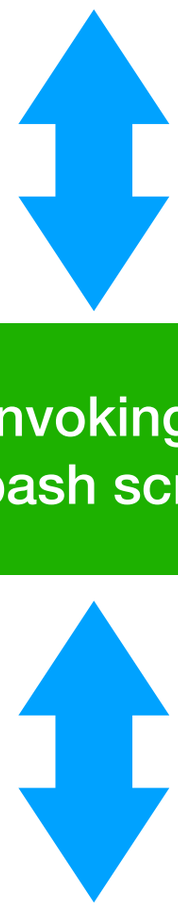
```
#!/bin/bash

echo “Hello World!”
date
```

A shell script



Invoking:
./script.sh



```
~ ❯❯❯ ./script.sh
Hello World!
Wed Jan 17 13:07:47 HKT 2018
~ ❯❯❯ /bin/bash script.sh
Hello World!
Wed Jan 17 13:07:57 HKT 2018
```

Invoking:
/bin/bash script.sh

- Starting a new bash shell.
- Reading and executing the content of “script.sh” in a line-by-line manner.

Shell Programming

- Syntax
  - Each shell has its own set of syntax
    - E.g., “/bin/bash” and “/bin/tcsh” have different sets of syntax.
  - Variable
    - $var means getting the value that is stored in the variable var

```
#!/bin/bash
a=“Hello World!”
b=$a
echo “Message is $b”
```

```
~ ❯❯❯ ./script.sh
Message is Hello World!
```

```
#!/bin/bash
a=“Hello World!”
echo “Message is $a_ext”
```

```
~ ❯❯❯ ./script.sh
Message is
```

```
#!/bin/bash
a=“Hello World!”
echo “Message is ${a}_ext”
```

```
~ ❯❯❯ ./script.sh
Message is Hello World!_ext
```

Curly braces define the start and the end of variable name.

Shell Programming (Cont.)

- Variable type
  - Only one type: STRING!

You need an external program to do the addition, e.g., using “expr”.

```
#!/bin/bash
a=“2”+“3”
echo $a
```

```
~ ❯❯❯ ./script.sh
2+3
```

```
#!/bin/bash
a=“2” + “3”
echo $a
```

```
~ ❯❯❯ ./script.sh
./script.sh: line 2: +: command not found
```

```
#!/bin/bash
a=`expr 2 + 3`
echo $a
```

```
~ ❯❯❯ ./script.sh
5
```

```
#!/bin/bash
a=`expr 2+3`
echo $a
```

```
~ ❯❯❯ ./script.sh
2+3
```

`…` is called sub-shell. It means calling a shell to execute the command specified and return the result.

Shell Programming (Cont.)

- Strings
  - Double-quote: Strings that you know
  - Single-quote: String without variable substitution or escape processing, i.e., verbatim mode

```
#!/bin/bash
a="String"
echo "$a"
```

```
~ ❯❯❯ ./script.sh
String
```

```
#!/bin/bash
a="String"
echo '$a'
```

```
~ ❯❯❯ ./script.sh
$a
```

Which languages treat quotes like shell scripts?

- Perl, PHP, Ruby, etc.

Which languages treat both quotes equally?

- JavaScript, Python, etc.

Bash CGI

```
#!/bin/bash

echo "Content-type: text/html"
echo ""

echo '<html>'
echo '<head>'
echo '<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">'
echo '<title>Hello World</title>'
echo '</head>'
echo '<body>'
echo 'Hello World'
echo '</body>'
echo '</html>'
```

Not powerful enough for writing CGI programs.

https://csci4140.cse.cuhk.edu.hk/cgi-bin/hello.sh

Interpreted High-level General-purpose Programming Language

- High-level Programming Language
  - Strong abstraction from the details of the computer
- General-purpose Programming Language
  - Writing general-purpose software, i.e., in a wide variety of application domains
- And Being Interpreted
  - A powerful and flexible language for server-side programming