# CSE2031 Software Tools - UNIX scripting

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## Plan

## Shell and commands

### Shell

Shell is the program that interprets your requests to run programs

### Command

- single word like i.e. `who` or command plus args
- ends with `newline` or ;
- & runs command in background

## Shell meta-characters

## Variables

### Environment variables

`$HOME, $PATH, $USER,`
`$MAIL, $PWD, $HOST,`

### Defined by user

No need to declare. Accessed by $

## Cammand processing

- Variable substitution
- Command execution by shell
    - Builtin commands executed within shell process (Example: cd)
    - For all other commands the shell
        - Scans search path for file with same name
        - Uses fork() to create a new process
        - Uses exec() to load the program and execute it

## Finding program

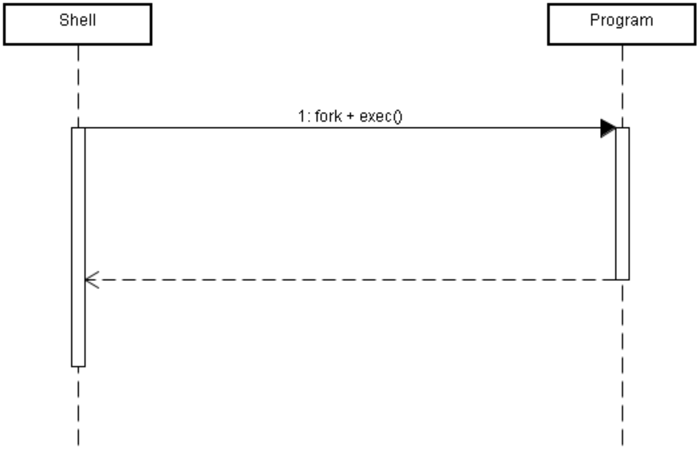
Search paths are storen in an variable `$PATH`. It is a list of directories separated by `':'`.These directories are searched in the order they are given.
Directories called "bin" typically contain programs under Unix
If a command name contains a `'/'`, the search path is not used i.e. `/usr/bin/cal`

## Program Execution

When executing a program, the shell:

- Starts a new process
- Executes the program file that it found
- Then waits for the program to finish

## Shell calls and waits

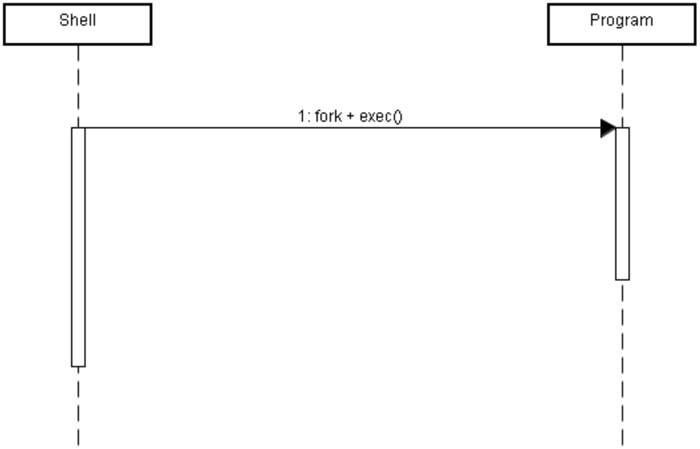


## Background Tasks

- You can use the '&' character to tell the shell to run the program in the background
- A background process is one that is running but that you are not waiting for

```
echo $HOME &
```

## Shell calls and does not wait



## Wait

We can change our mind The command `wait` will make the shell stop until all background processes have finished

## Conditional execution

```
command1 && command2
```

run command1; only if successful, run command2

```
command1 || command2
```

run command1; only if unsuccessful, run command2

## Exit status

Every program in Unix has an exit status:

- 0 = success/true
- nonzero = failure/false

Note that this is opposite to C!

## Loops

### sh

```
for variable in list_of_values
do
    command1
    command2
        ...
done
```

### bash loops (C-like)

```
for ((i=1; i <= 10 ; i++))
do
    commands
done
```

## If-Else Statements

```
if (condition_command) then
    command1
    command2
     ...
    last_command
else
    command1
    command2
     ...
    last_command
fi
```

## Quotes

### Single

Single quotes ' ' – All characters inside single quotes are treated as nonspecial (except ')

### Back-quotes

Back-quotes ` ` – the contents of the quote is treated as a shell command but special characters are not processed

### Double

Double-quotes " " like single quote except the variable substitution $ and backquotes ` are still treated as special characters

## Comments

Comments start with a '#' character, terminated by newline

```
#this is a comment
```

In the first line of a shell program `#!<shell>` specifies which shell is used to run the script

```
#!/cs/local/bin/sh
```

## Sub-shells

When needed shell calls fork to create new process (like fork() in C)

- We can do this explicitly with ( ) operator
- Causes command to be executed in a subshell
- Changes in subshell do not affect its parent!