

# Unix-like Operating Systems

Command line interface.

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# Discussion of homework

- Read info about [Secure Shell \(ssh\)](#) and [Public-key cryptography](#)
- Set SSH login without password

- 1 Create private and public keys.

```
ssh-keygen
```

- 2 Copy the public key to remote-host under user with the login name USER.

```
ssh-copy-id -i ~/.ssh/id_rsa.pub USER@fray1.fit.cvut.cz
```

- 3 Verify the login to remote-host without entering the password.

```
ssh USER@fray1.fit.cvut.cz
```

- Will the following command work now? Why yes or no?

```
ssh USER@fray1.fit.cvut.cz
```

# Discussion of homework

- Use only one command `date` to print the current date and the current time on the standard output (terminal) in the following format:

```
Today is Thursday, 05.10.2017 (week 40).  
The time is 14:13:57 [CEST].
```

## Hint

- `man date`
- `export LC_ALL=C`

# Command-line parsing order

- 1 Quoting
- 2 Comments
- 3 Lists, pipelines
- 4 Special characters
- 5 Word splitting
- 6 Pathname expansion
- 7 I/O redirection
- 8 Command execution

# Command-line parsing order – quoting

- What is quoting and which characters represent quoting?
- How do you print the following information on the standard output (terminal)? Try to find more correct solutions.

```
Value_of_variable_$HOME: /home/ps1
```

# Command-line parsing order – quoting

- How do you print the following information on the standard output?  
Try to find more correct solutions.

```
Output_of_command_pwd: /etc
Value_of_variable_$PWD: /etc
```

# Command-line parsing order – comments

- What character represents a comment in the shell?



# Command-line parsing order – lists, pipelines

- Which characters can separate commands in the shell and what is their meaning?
- Run the following commands sequentially (one by one):  
`sleep 10, date, hostname.`
- Run the following commands in parallel: `sleep 10, date, hostname.`
- Run a web browser in background.
- Print the output of command `"ls -lR /"` by command `less`.

# Command-line parsing order – special characters

- What special characters do you know?
- Tilde expansion `~`
  - Print the path to your home directory on standard output.
  - Print the path to the home directory of the user `muzikar` on standard output.

# Command-line parsing order – special characters

- Command substitution `' '` or `$( )` (newer syntax)
  - Save the kernel name and the kernel release to the shell variable `OS`.  
Hint: use command `uname`.
  - Can we omit the double quotes in the previous example?
  - Save the number of processes running on the system to the shell variable `LOAD`. Hint: use pipe of command `ps`, `tail`, and `wc`.
  - Can we omit the double quotes in the previous example?

# Command-line parsing order – special characters

- Parameter (Variable) expansion `$`
  - Print the contents of the variables `OS` and `LOAD` from the previous slide on the standard output by one command and one variable per one line.
  - Can we omit the double quotes in the previous example?
  - Use the command `mkdir` to create a subdirectory `bin` in your home directory.
  - Add path to this directory to the shell variable `PATH`.
  - Can we omit the double quotes in the previous example?

# Command-line parsing order – special characters

- Arithmetic expansion `$(( ))`
  - Create a command that 5 hours after execution writes a message "Hello word" on standard output. Hint: use command `sleep` and arithmetic expansion for timeout.
- Brace expansion `{ , }`
  - Brace expansion is a mechanism by which arbitrary strings may be generated.
  - Create (set modify time to) the following files by command `touch`:  
`f1, f1.txt, f1.c, f2, f2.txt, f2.c, f3, f3.txt, f3.c`
  - Print all integer numbers from 1 to 100 on the standard output.

# Command-line parsing order – word splitting

- The shell treats each character of shell variable IFS (Internal Field Separator) as a delimiter, and splits the results of the other expansions into words on these characters.
- The default value of IFS is space, tab, newline.
- Try the following commands and explain their different behavior.

```
echo $(ls -l)
```

```
echo "$ (ls -l) "
```

# Command-line parsing order – pathname expansion

- Which characters represent pathname expansion and what is their meaning?
- Explain the behavior of the following commands?

```
cd /usr/bin  
ls *q
```

```
ls q*
```

```
ls *q*
```

```
ls */*
```

```
ls ?
```

```
ls ??
```

# Command-line parsing order – pathname expansion

- Explain the behaviour of the following commands?

```
ls [a-j]?
```

```
ls [!a-j]?
```

```
ls ?[^a-j]
```



# Command-line parsing order – I/O redirection

- Which characters represent I/O redirection and what is their meaning?
- Explain the following commands?

```
wc -l /etc/group
```

```
wc -l < /etc/group
```

```
ls -l > f1 ; cat f1
```

```
date > f1 ; cat f1
```

```
date >> f1 ; cat f1
```

```
cat <<END >f1
```

```
Current date: $(date) in directory $PWD.
```

```
Login name: $USER
```

```
END
```

# Command-line parsing order – command execution

- If the command name contains no slashes (only name, no path). How can the shell locate it?
- The following commands can be used to see how each command name would be interpreted by the shell.

```
type ls
type -p ls
/usr/ucb/whereis ls
/usr/bin/which ls
echo $PATH
```

# Homework

- Try the following commands and explain their behaviour.

```
echo PWD is $PWD
```

```
echo PWD\ is\ \ $PWD
```

```
echo "PWD is      $PWD"
```

```
echo "\$PWD is      $PWD"
```

```
echo '\$PWD is      $PWD'
```

# Homework

- Try the following commands and explain their behaviour.

```
cmd=who
```

```
echo cmd
```

```
echo $cmd
```

```
echo "$cmd"
```

```
echo '$cmd'
```

```
echo `${cmd}`
```

```
$cmd
```

- How can we protect output format of the command `who`?