UNIX Shell-Scripting

With focus on bash

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Outline

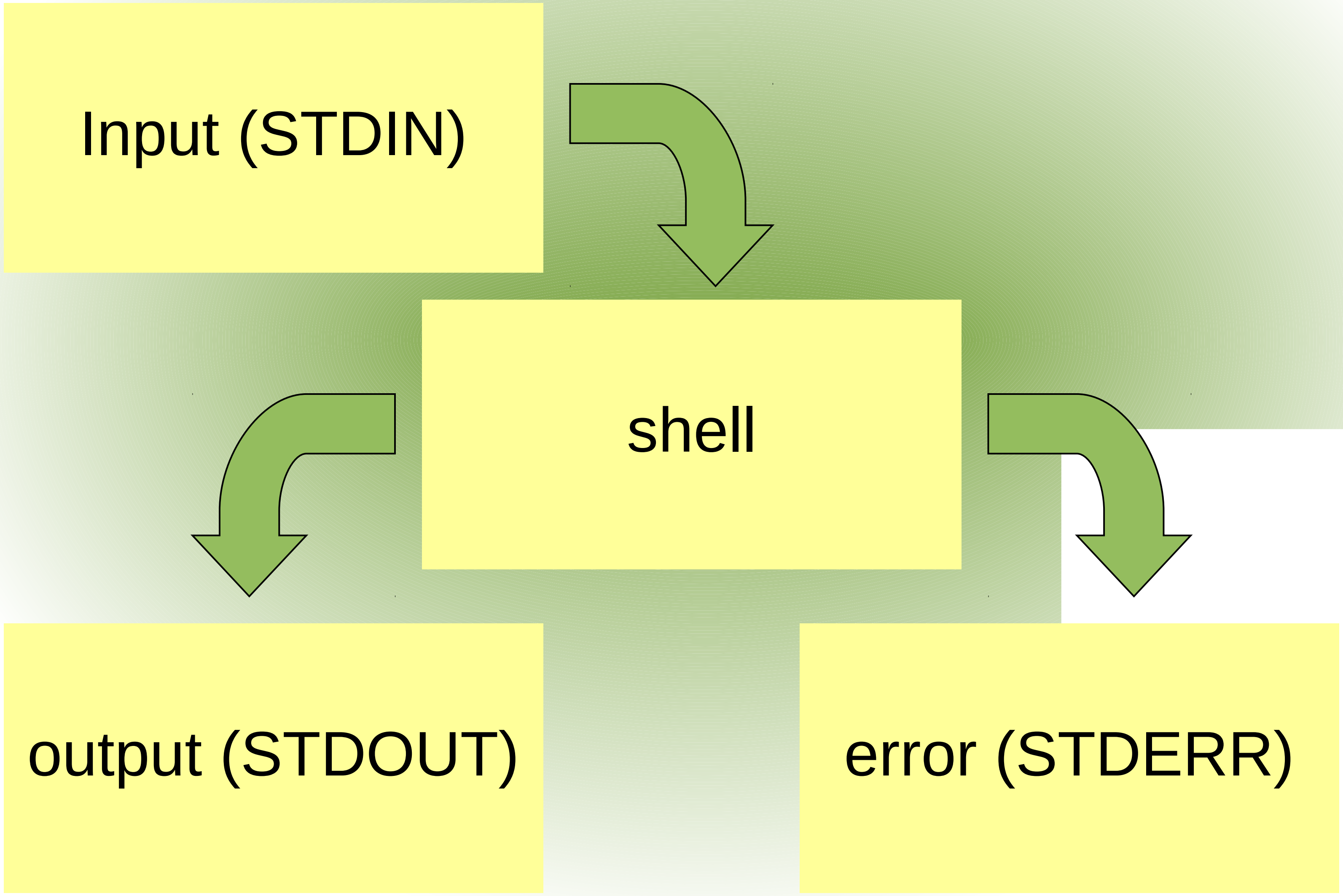
- What is a shell? A shell script?
- Introduction to bash
- Running Commands

What is a shell?

A Unix shell is a command-line interpreter or shell that provides a traditional user interface for the Unix operating system and for Unix-like systems. Users direct the operation of the computer by entering commands as text for a command line interpreter to execute or by creating text scripts of one or more such commands.

Source: http://en.wikipedia.org/wiki/Unix_shell

What is a shell?



Common Shells

- Bash (/bin/bash) Bourne again shell
- C Shell (/bin/csh)
- Turbo C Shell (/bin/tcsh)
- Korn Shell (/bin/ksh)

What is bin ?

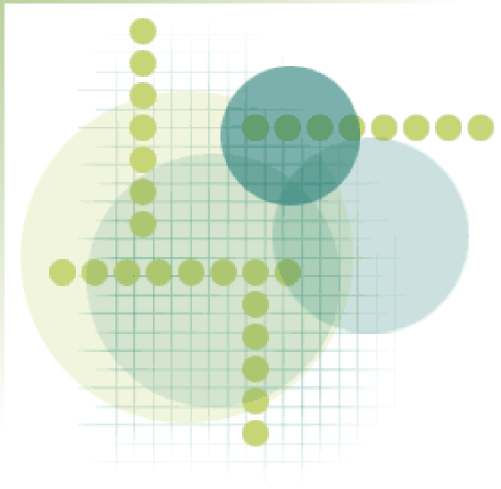
- `/bin`
- `/usr/bin`
- `/usr/local/bin`
- `/home/bjorn/bin`

What is a shell script?

- A text file
- With instructions
- Executable

What is a Shell Script?

```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world!'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```

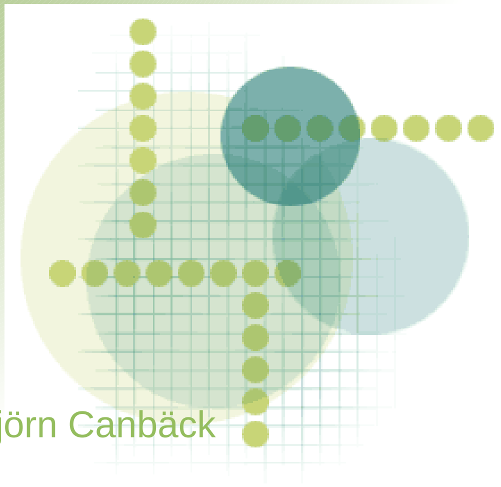


What is a Shell Script? A Text File

```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world!'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```

What is a Shell Script? How To Run

```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world!'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```



What is a Shell Script? What To Do

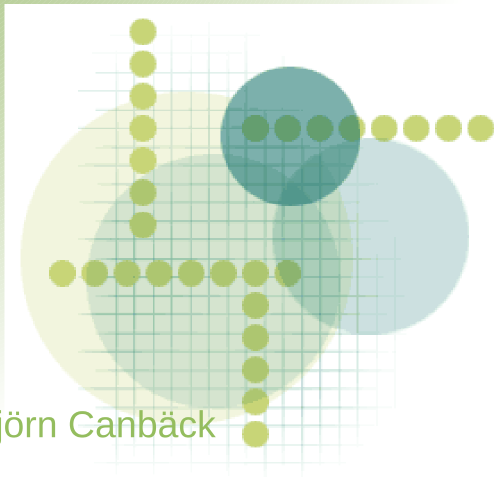
```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world!'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```

What is a Shell Script? Executable

```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world!'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```

What is a Shell Script? Running it

```
% cat > hello.sh <<HERE
#!/bin/sh
echo 'Hello world'
HERE
% chmod +x hello.sh
% ./hello.sh
Hello world!
```



Finding the program: PATH

- `% ./hello.sh`

-
  ```
  % echo $PATH
  /bin:/usr/bin:/usr/local/bin:
  /home/bjorn/bin
  ```

-
  ```
  % which echo
  /usr/bin/echo
  ```

Variables and the environment

```
% hello.sh
bash: hello.sh: Command not found
% PATH=“$PATH:.”
% hello.sh
Hello, world
```

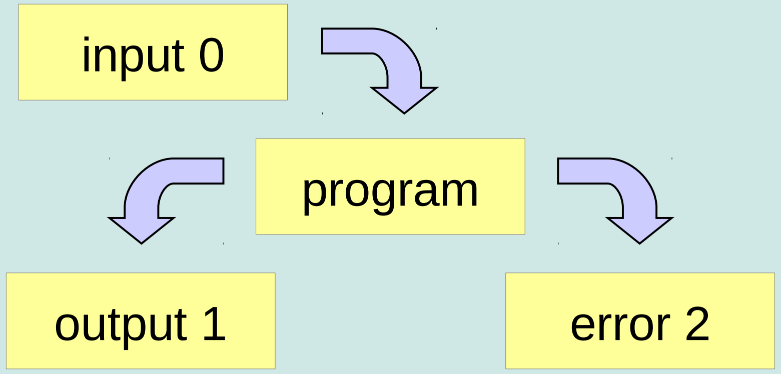
Redirection

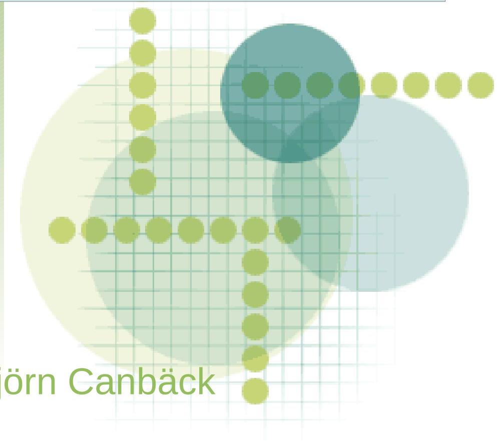
```
echo hej > test.txt
echo " hej" >> test.txt
```

Expert users only:

```
cat < test.txt

cat <<INPUT
Some input
INPUT

test.sh 2> myError

text.sh> myErrorAndOut 2>&1
```

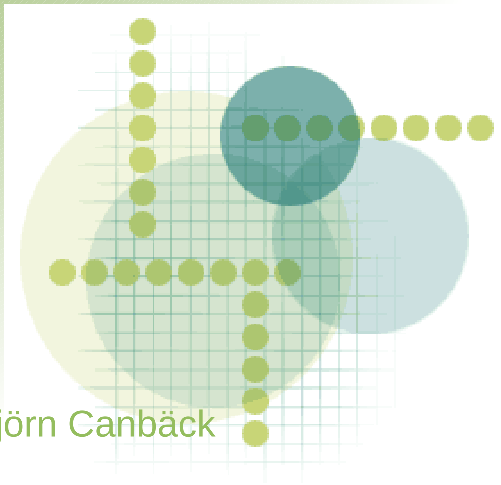
Expert users only:





Quoting

```
% echo '$USER'
$USER
% echo “$USER”
bjorn
% echo $USER
bjorn
% echo \”
”
% echo \>
>
```



How to learn

- man
  - man bash
  - man cat
  - man man
- *Learning the Bash Shell*, 2nd Ed.
- “Bash Reference” Cards

Continuing lines: \

```
% echo This \
Is \
  A \
Very \
Long \
 Command Line
This Is A Very Long Command Line
%
```

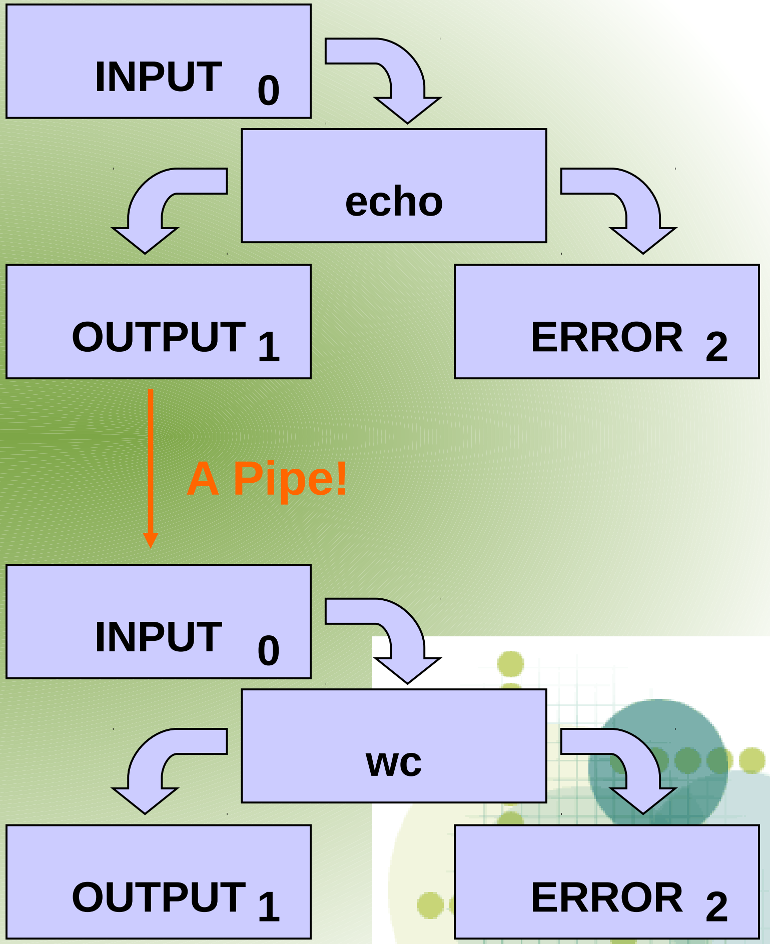
Make Your Life Easier

- TAB completion
- Control+R
- Control+S

Pipes

- Lots of Little Tools

```
echo “Hello” | \
 wc -c
```



Following is only if you want to learn more

Exit status (expert users)

- $?
- 0 is True

```
% ls /does/not/exist
% echo $?
1
% echo $?
0
```

Exit status: (expert users)

```
% cat > test.sh <<_TEST_
exit 3
_TEST_
% chmod +x test.sh
% ./test.sh
% echo $?
3
```

Logic: test (expert users)

```
% test 1 -lt 10
% echo $?
0
% test 1 == 10
% echo $?
1
```

Logic: test (expert users)

- `test`
- `[ ]`
  - `[ 1 –lt 10 ]`
- `[[ ]]`
  - `[[ “this string” =~ “this” ]]`
- `(( ))`
  - `(( 1 < 10 ))`

Logic: test (expert users)

- [-f /etc/passwd]
- [! –f /etc/passwd]
- [-f /etc/passwd –a –f /etc/shadow]
- [-f /etc/passwd –o –f /etc/shadow]

An aside: `$((  ))` for Math (expert users)

```
% echo $(( 1 + 2 ))
3
% echo $(( 2 * 3 ))
6
% echo $(( 1 / 3 ))
0
```

Logic: if (expert users)

```
if something
then
  :
# “elif” a contraction of “else if”:
elif something-else
then
  :
else
then
  :
fi
```

Logic: if (expert users)

```
if [ $USER –eq “borwicjh” ]
then
   :
# “elif” a contraction of “else if”:
elif ls /etc/oratab
then
   :
else
then
   :
fi
```

Logic: if (expert users)

```
# see if a file exists
if [ -e /etc/passwd ]
then
  echo “/etc/passwd exists”
else
  echo “/etc/passwd not found!”
fi
```

Logic: for (expert users)

```
for i in 1 2 3
do
  echo $i
done
```

Logic: for (expert users)

```
for i in /*
do
  echo “Listing $i:”
  ls -l $i
  read
done
```

Logic: for (expert users)

```
for i in /*
do
  echo “Listing $i:”
  ls -l $i
  read
done
```

Logic: for (expert users)

```
for i in /*
do
  echo “Listing $i:”
  ls -l $i
  read
done
```

Logic: C-style for (expert users)

```
for (( expr1     ;
       expr2     ;
       expr3     ))
do
  list
done
```

Logic: C-style for (expert users)

```
LIMIT=10
for (( a=1        ;
       a<=LIMIT ;
       a++        ))
do
  echo –n “$a ”
done
```

Logic: while

```
while *something*
do
   :

done
```

Logic: while

```
a=0; LIMIT=10
while [ "$a" -lt "$LIMIT" ]
do
  echo -n "$a ”
  a=$(( a + 1 ))
done
```

Counters

```
COUNTER=0
while [ -e “$FILE.COUNTER” ]
do
  COUNTER=$(( COUNTER + 1))
done
```

- Note: race condition

Reusing Code: “Sourcing”

```
% cat > /path/to/my/passwords <<_PW_
FTP_USER=“sct”
_PW_
% echo $FTP_USER

% . /path/to/my/passwords
% echo $FTP_USER
sct
%
```

Variable Manipulation

```
% FILEPATH=/path/to/my/output.lis
% echo $FILEPATH
/path/to/my/output.lis
% echo ${FILEPATH%.lis}
/path/to/my/output
% echo ${FILEPATH#*/}
path/to/my/output.lis
% echo ${FILEPATH##*/}
output.lis
```

Running Programs

Reasons for Running Programs

- Check Return Code
  - `$?`
- Get Job Output
  - `OUTPUT=`echo “Hello”``
  - `OUTPUT=$(echo “Hello”)`
- Send Output Somewhere
  - Redirection: <, >
  - Pipes

Email Notification

```
% echo “Message” | \
mail –s “Here’s your message” \
 borwicjh@wfu.edu
```

Dates

```
% DATESTRING=`date +%Y%m%d`
% echo $DATESTRING
20060125
% man date
```

FTP the Hard Way

```
ftp –n –u server.wfu.edu <<_FTP_
user username password
put FILE
_FTP_
```

FTP with wget

-
  ```
  wget \
  ftp://user:pass@server.wfu.edu/file
  ```

-
  ```
  wget –r \
  ftp://user:pass@server.wfu.edu/dir/
  ```

FTP with curl

```
curl –T upload-file \
  -u username:password \
  ftp://server.wfu.edu/dir/file
```

Searching: find

```
% find /home/borwicjh \
   -name ‘*.lis’
```

*[all files matching *.lis]*

```
% find /home/borwicjh \
   -mtime -1 –name ‘*.lis’
```

[.lis, if modified within 24h]*

```
% man find
```