

# **Windshield**

## **Language Reference Manual**

**Columbia University**  
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Windshield is a Windows Shell Script using the bash script as reference and implementing the fundamentals. Most of programming methods are similar with bash script. There are a few differences: some features in bash are simplified, and some new features are added in Windshield.

## 1. Lexical Conventions

### **Tokens**

Windshield contains 5 types of tokens, namely identifiers, keywords, numbers, strings, and others. White spaces and comments are neglected, except when used to separate tokens.

### **Whitespaces**

Whitespaces includes spaces(' '), tabs('\t'), new lines('\n'), returns('\r').

### **Comments**

There are two ways to write comments in Windshield. Single-line comments start with the special character '#' and ends at the end of the line. Multi-line comments starts at "/#" and ends at the first "#/" it sees.

### **1.1 Identifiers**

An identifier is a sequence of letters, digits and underscores. The first character must be a letter. Identifiers are case-sensitive.

### **1.2 Keywords**

Here's a table of reserved word. They may not be used as variable names when writing a program in Windshield.

if	then	else	elif	fi
case	esac	while	do	done
for	echo	function	return	

### 1.3 Numbers

Numbers in windshield are either an integer or a floating point number.

#### 1.3.1 Integer

A sequence of one or more digits, if there are more than 1 digit, the first digit must be non-zero.

#### 1.3.2 Floating point number

Contains an optional integer part, a '.', a decimal part.

### 1.4 String

String literals are characters contained in a pair of double quotes or single quotes, but not in a mixture of the two, i.e. if a string literal starts with a double quote("), it must end with a double quote.

### 1.5 Others

[	]	(	)	==	>=
<=	>	<	!=	.	,
;		&&		-d	-e

## 2. Types

Like shell scripts, variables in Windshield does not need to be declared a specific variable type upon creation. Instead it's type is automatically determined when that variable is assigned a value.

The underlying types in Windshield are: string, integer, float.

## 3 Expressions

WindShield has tree major expression forms: "Define User Variables", "Command Lines" and "Combination of Command Lines". "Combination of command lines" means programmers can use "quoto", "Redirection", or "pipe" skills to combine multiple command lines into one command line. Not like bash script, WindShield limits each code line to contain only one expression.

### 3.1 Define User Variables

define user variables:

Syntax:

variable name=value

'value' is assigned to given 'variable name' and Value must be on right side = sign.

*Ex: STR="Hello World!"*

### 3.2 Command Lines

Shell Script is series of command written in plain text file. Command lines contain two types, one is build-in commands which is defined in chap1, the other is own programs.

*Ex: echo "Hello World!"*

*C:\myprogram.exe*

#### 3.2.1 Use Variables

When a variable is defined, it lacks the '\$' in front. But once a variable is used or referenced, it should be put the '\$' in front.

*Ex: STR="Hello World!"*

*echo \$STR*

#### 3.2.2 Mathematics

WindShield limits string values to be quoted by "", so it is not ambiguous between string and operations. That is, "5+3" is a string, 5+3 is an operation. By this limitation, we can directly write mathematical operation without 'expr' command in bash.

*v="5+3" # v is a string with content "5+3"*

*v=5+3 # v is 8*

### 3.3 Combination of command lines

One of the important features of WindShield is its ability to "glue" multiple command lines into one command line by using skills of "quoto", "Redirection", or "pipe"

### 3.3.1 quot

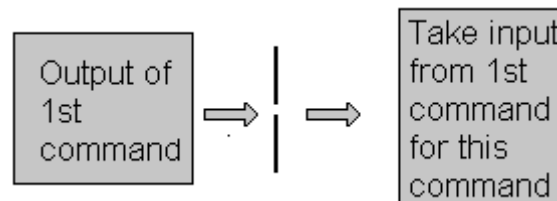
There are three types of quotes

Quotes	Name	Meaning
"	Double Quotes	"Double Quotes" - Anything enclosed in double quotes removed meaning of that characters.
'	Single quotes	'Single quotes' - Enclosed in single quotes remains unchanged.
`	Back quote	`date` - To execute command.

Ex: echo "Today is `date`"

### 3.3.2 pipe

A pipe is a way to connect the output of one program to the input of another program without any temporary file.



*Syntax:*

command1 | command2

Ex:

*cat file1 | sed s/Hello/World/ | myprogram.exe > file3*

# replace any "Hello" with "World" in file1 and send the replaced content to  
# myprogram.exe, which output is recorded in file3

### 3.4. I/O Redirection

There are three redirection symbols >, >>, <

(1) > Redirector Symbol

*Syntax:*

command > filename

To output commands result to file. If file already exist, it will be overwritten else new file is created. Ex: To send output of ls command give

\$ ls > myfiles

Now if 'myfiles' file exist in your current directory it will be overwritten without any type of warning.

## (2) >> Redirector Symbol

Syntax:

```
command >> filename
```

To output commands result to END of file. If file exists, it will be opened and new information/data will be written to END of file, without losing previous information/data. And if file does not exist, then new file is created. Ex: send output of date command to already exist file give command

```
$ date >> myfiles
```

## (3) < Redirector Symbol

Syntax:

```
command < filename
```

To take input to command from file. Ex: To take input for cat command from file.

```
$ cat < myfiles
```

## 4. Control Flow

There are several common control flow statements in Windshield, such as if, case, for and while.

### 4.1 Conditional

We take an example to introduce “if”.

```
if [condition_1]
then
    statement_1
    statement_2
    ...
elif [condition_2]
then
    statement_3
    statement_4
    ...
else
    statement_5
    statement_6
    ...
fi
fi
```

'condition\_numbers' is a conditional judgment. Operators in the conditional judgement are listed in *the follows*.

A >= B : A is larger than or equals to B

A <= B : A is less than or equals to B

A > B : A is larger than B

A < B : A is less than B

A == B : A equals to B

A != B : A does not equal to B

condition\_1 && condition\_2 : condition\_1 and condition\_2

condition\_1 || condition\_2 : condition\_1 or condition\_2

-d dir : if this dir exists, return true

-e file : if this file exists, return true.

Note: The next line of “if [condition\_1]” should be “then”, and the end line of the whole representation should be “fi”.

The second condition control: 'case'.

```
case variable in
    variable_1)  statement_1
                 statement_2
                 ...
                 ;;
    variable_2)  statement_11
                 statement_22
                 ...
                 ;;
    *)          statement_111
                 statement_222
                 ...
                 ;;
esac
```

## 4.2 Iteration

There are two iterative controls: 'for' and 'while'.

```
for variable in expr
do
    statement_1
    statement_2
    ...
done
```

```
for char in A B C D E F G
do
    echo "$char"
done
```

```
for (( expr ; condition ; expr ))
do
    statement_1
    statement_2
    ...
done
```

```
while [condition]
do
    statement_1
    statement_2
    ...
done
```

## 5. Functions (user-defined)

Functions in Windshield are a series of statements and commands, that completes a specific task. The syntax to write a function is as follows:



```
function name (){  
    statement 1;  
    statement 2;  
    .  
    statement n;  
    return statement;  
}
```

The arguments passed into a function are accessed in the function through “\$N”, where N is the number of the argument.

## 6. Build-in commands

The small part but basic Unix/Linux commands will be included in Windshield, such as echo, cp, mv, rm, mkdir, rmdir, cd, df, du, ls, cat, pwd, basename, expr and read. Two useful utilities-sed and grep are also included in Windshield. The two utilities allow regular expression representation for their inputs.