User's Manual

CS 450: WStem

Introduction

Our operating system, named after our group, **WStem**, is a command-line-based operating system created as part of CS-450.

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Table of Contents

Available Commands

Below is a list of available commands and their descriptions:

General Commands

- **version**: Displays the current version of MPX.
  Usage: Type `version` then press *Enter*.

- **help**: Displays a list of all available commands.
  Usage: Type `help` then press *Enter*.

- **shutdown**: Terminates the operating system.
  Usage: Type `shutdown` then press *Enter*.

Time and Date Commands

- **get time**: Retrieves the current system time.
  Usage: Type `get time` then press *Enter*.

- **set time**: Updates the system time.
  Usage: Type `set time`, then *Enter*:

  - Enter an hour (00-23)
  - Enter minutes (00-59)
  - Enter seconds (00-59)
  - Press *Enter* after each input.
  - The system re-prompts if an invalid number is entered.

- **get date**: Retrieves the current system date.
  Usage: Type `get date` then press *Enter*.

- **set date**: Updates the system date.
  Usage: Type `set date`, then *Enter*:

  - Enter a year (0-99)
  - Enter month (1-12)
  - Enter day (1-31, based on the month)
  - Press *Enter* after each input. Invalid inputs trigger a re-prompt.'

PCB Commands

- **create pcb**: Creates a new process control block. **(REMOVED AS OF R4)**
  Usage: `create pcb`, then *Enter*:

  - PCB Name (1-8 characters)
  - PCB Class (1 = user, 0 = system)
  - PCB Priority (0-9)

- **delete pcb**: Deletes an existing PCB.
  Usage: `delete pcb`, then *Enter* the PCB Name.

- **block pcb**: Moves a PCB to the blocked queue.
  Usage: `block pcb`, then *Enter* the PCB Name.

- **unblock pcb**: Moves a PCB back to the ready queue.
  Usage: `unblock pcb`, then *Enter* the PCB Name.

- **suspend pcb**: Suspends a PCB.
  Usage: `suspend pcb`, then *Enter* the PCB Name.

- **resume pcb**: Resumes a suspended PCB.
  Usage: `resume pcb`, then *Enter* the PCB Name.

- **set pcb priority**: Changes a PCB's priority.
  Usage: `set priority`, then *Enter*:

    - PCB Name
    - Priority (0-9)

- **show pcb**: Displays PCB details.
  Usage: `show pcb`, then *Enter* the PCB Name.

- **show ready**: Displays all PCBs in the ready queue.
  Usage: `show ready`, then press *Enter*.

- **show blocked**: Displays all PCBs in the blocked queue.
  Usage: `show blocked`, then press *Enter*.

- **show all**: Displays all PCBs.
  Usage: `show all`, then press *Enter*.

R3 Commands

- **yield**: Causes the Command Handler to yield the CPU. **(REMOVED as of R4)**
  Usage: Type `yield`, then press Enter.

- **load r3**: Loads the R3 test processes in a non-suspended state.
  Usage: Type `load r3`, then press Enter.

- **load r3 suspended**: Loads the R3 test processes in a suspended state.
  Usage: Type `load r3 suspended`, then press Enter.

- **load proc1**: Loads the R3 process 1 in a ready and suspended state.
  Usage: Type `load proc1`, then press Enter.

- **load proc2**: Loads the R3 process 2 in a ready and suspended state.
  Usage: Type `load proc2`, then press Enter.

- **load proc3**: Loads the R3 process 3 in a ready and suspended state.
  Usage: Type `load proc3`, then press Enter.

- **load proc4**: Loads the R3 process 4 in a ready and suspended state.
  Usage: Type `load proc4`, then press Enter.

- **load proc5**: Loads the R3 process 5 in a ready and suspended state.
  Usage: Type `load proc5`, then press Enter.

Alarm Command

- **set alarm**: Sets an alarm in the system that goes off when the time that it is given is met with a message that is also provided by the user.
  Usage: `set alarm`, then *Enter*:
  - Time for the alarm in the format:
    - i. Enter an hour (00-23)
    - ii. Enter minutes (00-59)
    - iii. Enter seconds (00-59)
  - Message of the alarm.

Memory Commands

- **allocate memory**: Allocates a block of memory of the size that the user provides. **(REMOVED AS OF R5.2)**
  Usage: `allocate memory`, then *Enter*:
  - The size of the memory block in bytes.

- **free memory**: Frees a block of memory at the start address given by the user. **(REMOVED AS OF R5.2)**
  - **Usage**: `free memory`, then *Enter*:
    - The start address of the block in hexadecimal (w/o the preceding "0x")

- **show allocated memory**: Shows all the allocated memory blocks including their starting address in hexadecimal and size in bytes.
  - **Usage**: `show allocated memory`, then press Enter.

- **show free memory**: Shows all the free memory blocks including their starting address in hexadecimal and size in bytes.
  - **Usage**: `show free memory`, then press Enter.

Examples
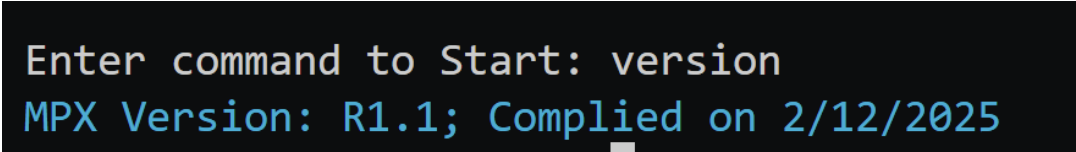
General Commands

Getting command assistance

help
Output:

Picture 1+2: The result of calling "help" in the terminal.
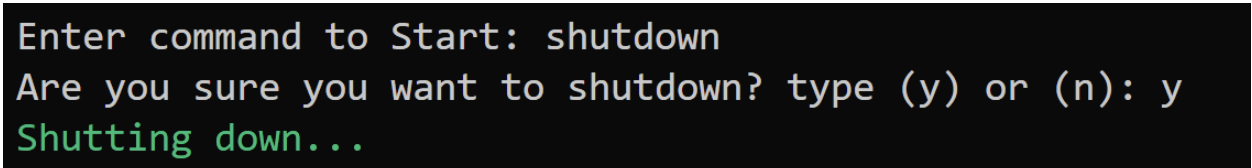
Display the current version of the MPX

version

Output:

Picture 3: The result of calling "version" in the terminal.

Shuts down the system

shutdown

Output:
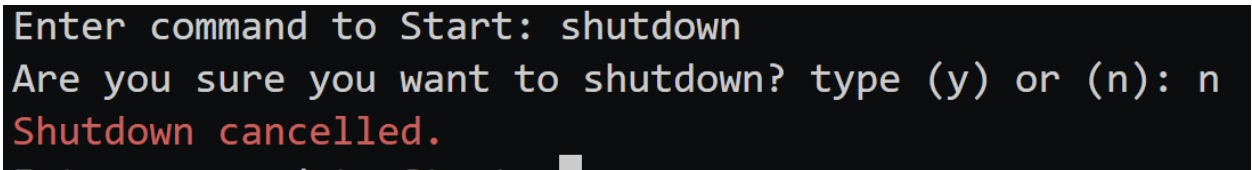
With user input = y

Picture 4: The result of calling "shutdown" followed by a "y" in the terminal.

With user input = n

Picture 5: The result of calling "shutdown" followed by an "n" in the terminal.
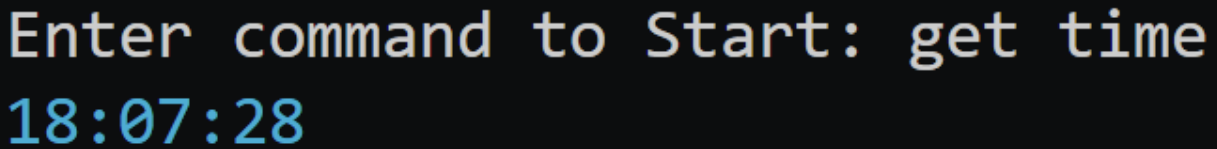
Time and Date Commands

Retrieves the system's time

get time
Output:

```
Enter command to Start: get time
18:07:28
```

Picture 6: The result of calling "get time" in the terminal, resulting in the system time printing out.
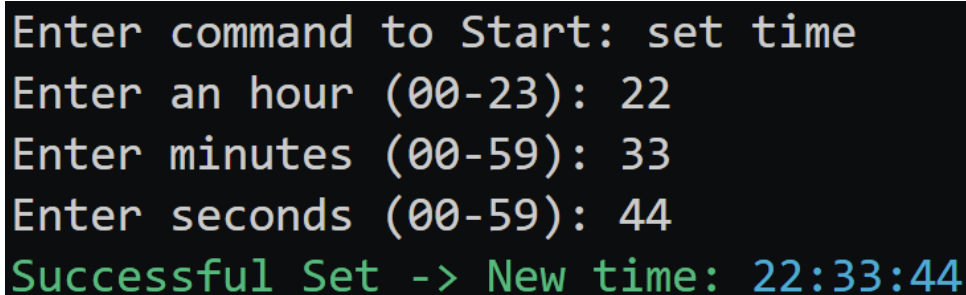
Sets the system's time

set time
22
33
44
Output:

```
Enter command to Start: set time
Enter an hour (00-23): 22
Enter minutes (00-59): 33
Enter seconds (00-59): 44
Successful Set -> New time: 22:33:44
```

Picture 7: The result of calling "set time", followed by "22", "33", and "44" in the terminal, resulting in the system time changing to 22:33:44 and being printed out.

Gets the system's date

get date
Output:

```
Enter command to Start: get date
02/12/2025
```

Picture 8: The result of calling "get date" in the terminal, resulting in the system date printing out.

Sets the system's date

set date

20

25

2

26

Output:

```
Enter command to Start: set date
Enter an century (17-21): 20
Enter an year (0-99): 25
Enter a month (1-12): 2
Enter a day (1-31; end bound depending on month): 26
Successful Set -> New date: 02/26/2025
```

Picture 9: The result of calling "set date", followed by "20", "25", "2", and "26" in the terminal, resulting in the system date being changed to 02/26/2025 and is printed out.

PCB Commands

Creating a PCB (REMOVED as of R3)

create pcb

Example

1

5

Output:

```
Enter command to Start: create pcb
Enter PCB Name: Example
Enter PCB Class (1 for user, 0 for system): 1
Enter PCB Priority (Between 0-9): 5
The following PCB created successfully:

PCB Process Name: Example
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & UNSUSPENDED
PCB Process Priority: 5
```

Picture 11: The result of calling "create pcb", followed by "Example", "1" and "5" in the terminal, resulting in a PCB being created and printed out.

Deleting a PCB

delete pcb
Example
Output:

Picture 12: The result of calling "delete pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" being deleted.

Blocking a PCB

block pcb
Example
Output:

Picture 13: The result of calling "block pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" being blocked and the altered PCB being printed.

Unblocking a PCB

unblock pcb
Example
Output:

```
Enter command to Start: unblock pcb
Enter PCB Name: Example
PCB successfully unblocked:

PCB Process Name: Example
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & UNSUSPENDED
PCB Process Priority: 2
```
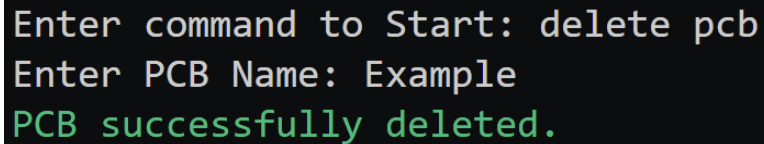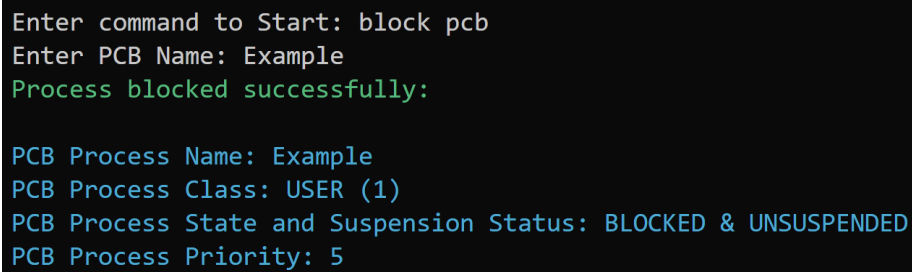
Picture 14: The result of calling "unblock pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" being unblocked and the altered PCB being printed.

Suspending a PCB

suspend pcb
Example
Output:

```
Enter command to Start: suspend pcb
Enter PCB Name: Example
PCB suspended successfully.

PCB Process Name: Example
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & SUSPENDED
PCB Process Priority: 2
```

Picture 15: The result of calling "suspend pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" being suspended and the altered PCB being printed.

Resuming a PCB

resume pcb
Example
Output:

```
Enter command to Start: resume pcb
Enter PCB Name: Example
PCB resumed successfully.

PCB Process Name: Example
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & UNSUSPENDED
PCB Process Priority: 2
```

Picture 16: The result of calling "resume pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" being resumed and the altered PCB being printed.

Changes a PCB's Priority

set pcb priority
Example
9
Output:

```
Enter command to Start: set pcb priority
Enter PCB Name: Example
Enter PCB Priority (Between 0-9): 9
PCB priority set successfully.

PCB Process Name: Example
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & UNSUSPENDED
PCB Process Priority: 9
```

Picture 17: The result of calling "set pcb priority", followed by "Example" and "9" in the terminal, resulting in the PCB with the name "Example" having its priority changed.

Shows properties of a PCB

show pcb
Example
Output:

Picture 18: The result of calling "show pcb", followed by "Example" in the terminal, resulting in the PCB with the name "Example" and it's properties being printed.

Shows all ready PCBs and their properties

show ready
Output:

Picture 19: The result of calling "show ready" in the terminal, resulting in all the ready PCBs being printed out.

Shows all blocked PCBs and their properties

show blocked

Output:

Picture 20: The result of calling "show blocked" in the terminal, resulting in all the blocked PCBs being printed out.

Shows all PCBs and their properties

show all

Output:

Picture 21: The result of calling "show all" in the terminal, resulting in all PCB's being printed out.

R3/Alarm Commands

Yield the CPU, moving the current process to the ready queue (ONLY USED IN R3)
yield
Output:

Picture 22: The result of calling "yield" in the terminal after loading r3 test processes. Printing out the dispatching and exiting of those processes.

Load the R3 test processes in a non-suspended state.
load r3
Output:

Picture 23: The result of calling "load r3" in the terminal which loads all the r3 test processes.

Load the R3 test processes in a suspended state.
load r3 suspended
Output:

```
Enter command to Start: load r3 suspended
Loading suspended R3 processes into memory:
proc1 loaded successfully in suspended state.
proc2 loaded successfully in suspended state.
proc3 loaded successfully in suspended state.
proc4 loaded successfully in suspended state.
proc5 loaded successfully in suspended state.
```

Picture 24: The result of calling "load r3 suspended" in the terminal which loads all the r3 test processes in a suspended state.

Set an alarm process with a message at a certain time.
set alarm
10
10
10
Hello
Output:

```
Enter command to Start: set alarm
Enter hour (0-23): 10
Enter minutes (0-59): 10
Enter seconds (0-59): 10
Enter your alarm message (max 99 chars): Hello
Alarm has been set!
```

Picture 24: The result of calling "set alarm" in the terminal followed by "10", "10", "10", and "Hello" making an alarm that will go off at 10:10:10 with the message "Hello".

Loads a singular R3 process in a ready and suspended state.
load proc1 (Replace 1 w/ any number between 1 and 5 for proc1 - proc5)
3
Output:

```
Enter command to Start: load proc1
Enter PCB Priority (Between 0-9): 3
The Following Process Created Successfully:
PCB Process Name: proc1
PCB Process Class: USER (1)
PCB Process State and Suspension Status: READY & SUSPENDED
PCB Process Priority: 3
```

Picture 25: Loads a R3 process as requested by the user (in this instance proc1) with the provided priority (3).

Memory Commands

***Allocating memory manually* (REMOVED AS OF R5.2)**
allocate memory
210
Output:

```
Enter command to Start: allocate memory
Enter size to allocate (in bytes): 210
Allocated memory at address: D000014
```

Picture 26: The result of calling "allocate memory" in the terminal followed by "210" that manually allocates a block of memory 210Kb large. It also returns the start address of the block in hexadecimal (D000014).

Freeing memory manually (REMOVED AS OF R5.2)
free memory
D000014
Output:

```
Enter address to free (in hexadecimal w/o the preceding 0x): D000014
Memory at address: D000014
Freed Successfully!
```

Picture 27: The result of calling "free memory" in the terminal followed by "D000014" that manually frees an allocated block of memory.

Show allocated memory list
show allocated memory
Output:

```
Enter command to Start: show allocated memory
Allocated Memory Blocks:
Start Address: D000014, Size: 1088 bytes
Start Address: D000468, Size: 1088 bytes
Start Address: D0008BC, Size: 1000 bytes
Start Address: D000CB8, Size: 14120 bytes
Start Address: D0043F4, Size: 4513 bytes
```

Picture 28: The result of calling "show allocated memory" in the terminal that prints the allocated memory list with their attributes.

Show free memory list
show free memory
Output:

```
Enter command to Start: show free memory
Free Memory Blocks:
Start Address: D000468, Size: 1088 bytes
Start Address: D0055A9, Size: 28091 bytes
```

Picture 29: The result of calling "show free memory" in the terminal that prints the free memory list with their attributes.

Troubleshooting

Issue	Solution
Command not recognized	Ensure correct spelling, syntax, and case sensitivity. Use `help` if needed.
Re-prompt for date/time input	Use a max of 2 characters; avoid spaces or hyphens.
Red Errors	Something unexpected or out of bounds was provided. The error will explain the particular issue, move forward from there.
Unexpected errors	Restart the OS and try again.

Notes & Tips

- Commands are **case-sensitive**.
- Ensure the correct format for commands requiring arguments.
- Avoid leading or trailing spaces.

Usage Instructions:
Type commands in the command line and press *Enter*. Follow prompts when required.