Course COMP-8567
Assignment 02
Summer 2024
Due Date: Jul/01/2024, 11 PM
50 Marks

Please read these three points carefully:

1. Just a reminder that like all labs/assignment/project, this assignment **must be implemented** on our CS Linux sever using your official university login.
2. Since this assignment involves creating a number of processes to test your program, you might inadvertently create a **chain of processes** that might lead to what is known as a **"fork bomb"** that uses up a lot of system resources.
3. Regardless, it is It is your sole responsibility to execute the statement: **$killall -u *username*** periodically/mandatorily **when you are done working on this assignment on a given day** failing which zero marks will be given to the assignment if there are any complaints from the system administrator

Write a C program prc24s.c that searches for processes in the process tree (rooted at a specified process) and prints the requested information based on the input parameters.

Synopsis :

prc24s [Option] [*root_process]* [*process_id*]

- **When [Option] is not provided:** Lists the PID, PPID of *process_id* if *process_id* belongs to the process tree rooted at *root_process* else does not print anything
  - *Both root_process* and process_id are the PIDs of processes that are descendants of **any** Bash Process that belongs to the user
- **When [Option] is provided:** Please **see the next page** for the action to be performed for each option.

Note: In any of the following options, if process_id does not belong to the process tree rooted at root_process , you need to print *" The process (list the process_id) does not belong to the tree rooted at (list the root_process)"*

OPTION

-dx The *root_process* kills all its descendants using *SIGKILL*

-dt The *root_process* sends SIGSTOP to all its descendants

-dc The *root_process* sends SIGCONT to all its descendants that have been paused

-rp *root_process* kills *process_id*

-nd lists the PIDs of all the **non-direct** descendants of *process_id*

-dd lists the PIDs of all the **immediate** descendants of *process_id*

-sb lists the PIDs of all the **sibling processes** of *process_id*

-bz lists the PIDs of all the **sibling processes** of *process_id* that are defunct

- zd Lists the PIDs of all **descendents of** *process_id* **that are defunct**

- od Lists the PIDs of all **descendents of** *process_id* **that are** orphans

- gc lists the PIDs of all the **grandchildren** of *process_id*

- sz prints the status of the *process_id* (Defunct/ Not Defunct)

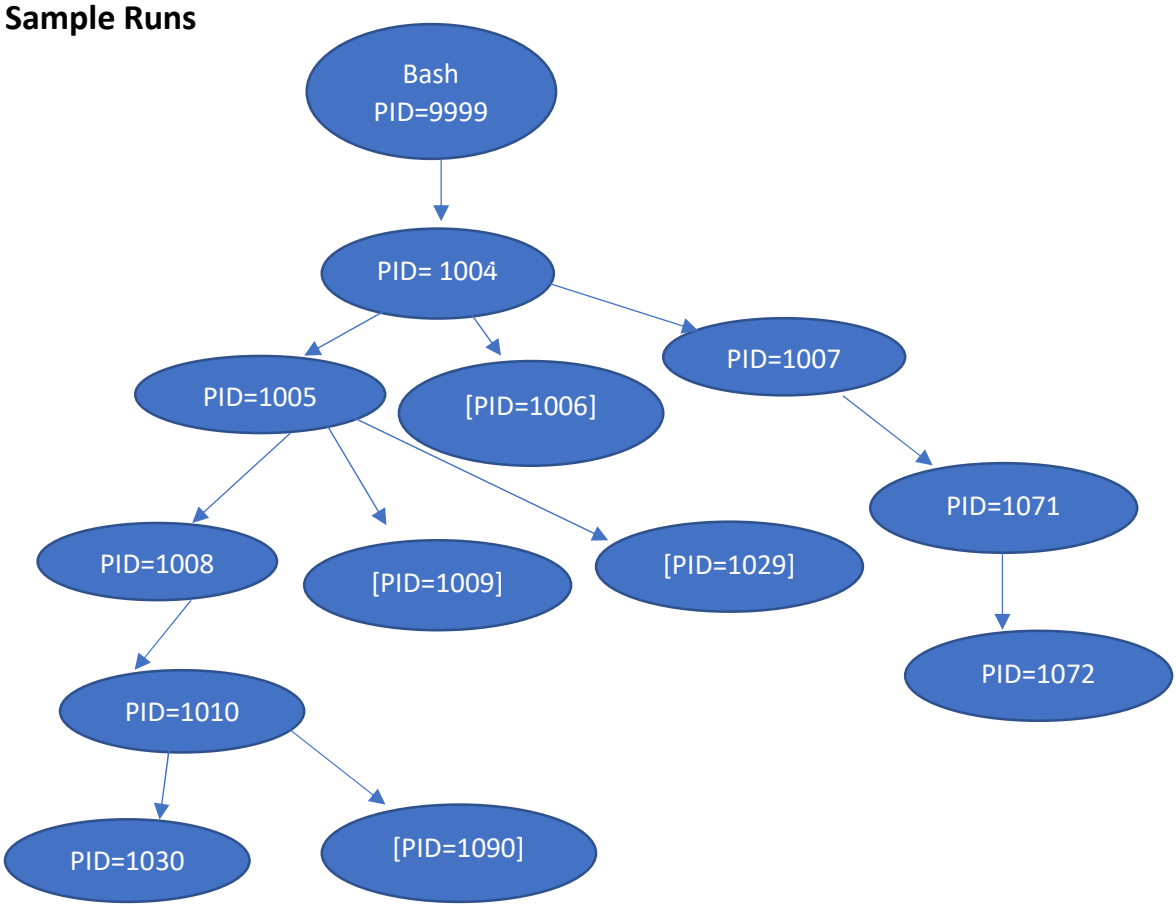
- so prints the status of the *process_id* (Orphan/Not Orphan)

- kz Kills the parents of all zombie process that are the descendants of proceed_id

//Note: process_id might also get killed

Note: This is an example only. Your assignment must work for all valid cases as per the requirement.

Sample Runs



Note: In the above example, [PID=1006], [PID=1009], [PID=1029] and [PID=1090] are defunct (zombie) processes at the time of execution of the following programs

$ prc24s 1004 1009
1009 1005
 	
$ prc24s 1004 1072
1072 1071
 	
$ prc24s 1007 1005
Does not belong to the process tree
 	
$ prc24s 1005 1020
Does not belong to the process tree
 	
$ prc24s -nd 1004 1005
1010
1030
1090
 	
$ prc24s -nd 1008 1010
No non-direct descendants
 	
$ prc24s -dd 1004 1005
1008
1009
1029
 	
$ prc24s -dd 1008 1030
No direct descendants
	$ prc24s -zd 1004 1005
	1009
	1029
	1090
	
	$ prc24s -zd 1004 1007
	No descendant zombie process/es
	
	$ prc24s -bz 1004 1030
	1090
	
	$ prc24s -sb 1005 1071
	Does not belong to the process tree
	
	$ prc24s -sb 1004 1072
	No sibling/s
	
	$ prc24s -sz 1008 1030
	Not defunct
	
	$ prc24s -sz 1008 1090 -zs
	Defunct
	
	$ prc24s -gc 1005 1008
	1030
	1090
	
	$ prc24s -gc 1008 1010
	No grandchildren

Comments and explanation of the program

-You are required to include adequate and appropriate comments to explain the working of the program.
-Please see the assignment rubrics for more information

Submission:

Submission Instructions (Note: Plagiarism Detection Tool: MOSS)

You need to submit the following:
1. prc24s_firstname_lastname_SID.c
3. Zoom/Google Drive recording link explaining the following (not more than 15 minutes)

- Your camera must be on
- Overall working of the code and various modules (around 8-9 minutes)
- Execution of the code under various inputs/conditions as per the requirements of the assignment (around 6-7 minutes)
- Other form of links/MP4 files will NOT be acceptable.
- Include the link in the COMMENTS section.