

Project 1: NPShell

NP TA 誌佑

Important Dates

- **Deadline: 10/24 (Sun.) 23:55**
- **Demo: 10/27 (Wed.)**
 - Online demo
 - Test your program and ask some questions
- **Office hour: 10/18 (Mon.) 10:00 - 12:00**
 - Online discussion using Microsoft Teams
 - You should send an email to all the TAs to make an appointment

About Questions

- You are **HIGHLY** encouraged to ask your questions on Microsoft Teams **Project 1 channel**.
 - Check the spec and other questions first
- For personal problems, you can mail to **all** the TAs:
 - lcd010308@gmail.com
 - kuo0404@gmail.com
 - hpc.cs08g@nctu.edu.tw
 - kyojeong.cs10@nycu.edu.tw

Reminders

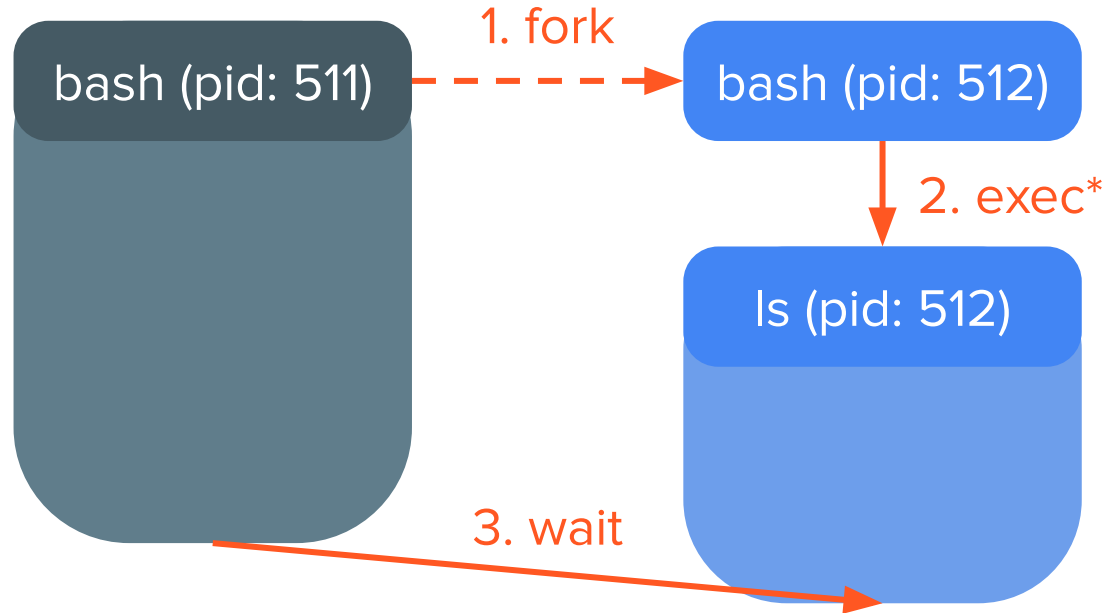
- Make sure you are invited to our Bitbucket workspace
- Make sure you have an account for NYCU CSIT workstation
 - You need this account to login to NP servers

NP Servers

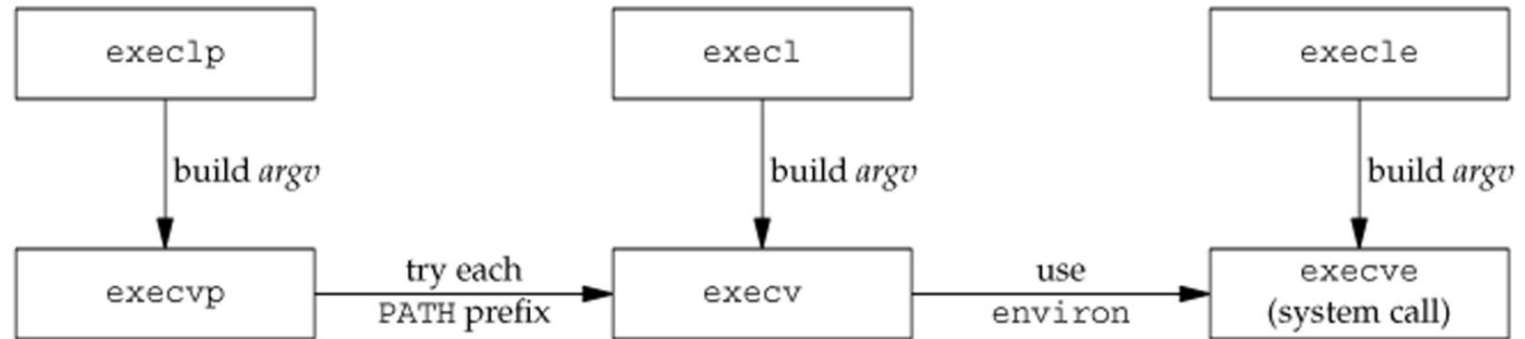
- **Your projects will be run on NP servers during demo**
- NP projects should run on NP servers
- Any abuse of NP servers will be recorded
- Do not leave any zombie process in the system

Implementation

Spawn a New Process



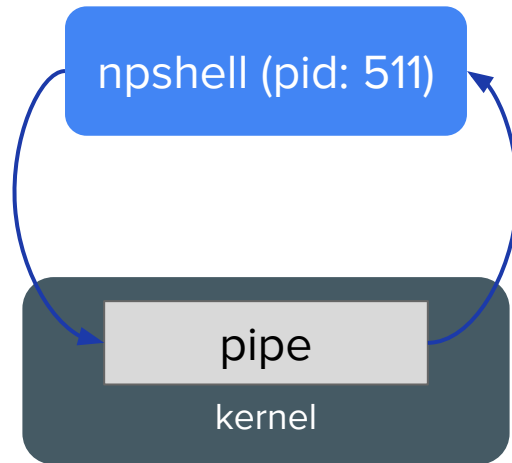
The exec family of functions



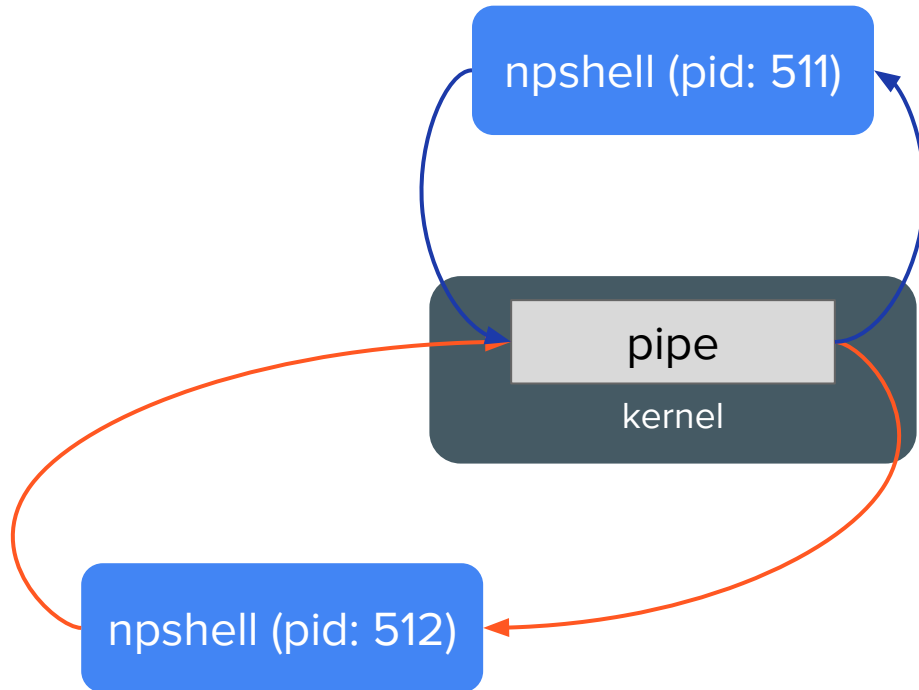
Pipe Between Processes

npshell (pid: 511)

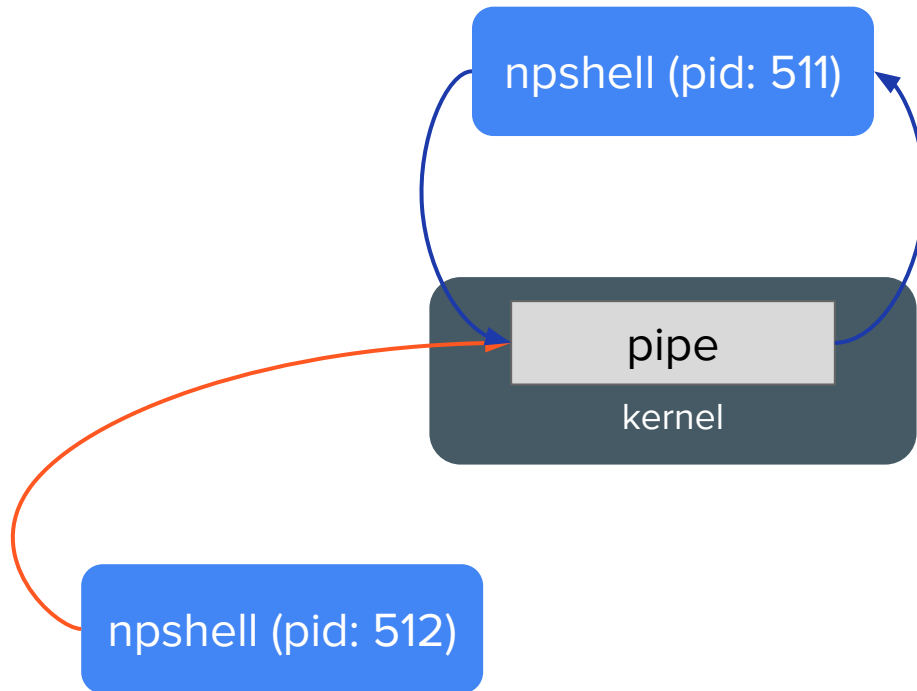
Pipe Between Processes - pipe



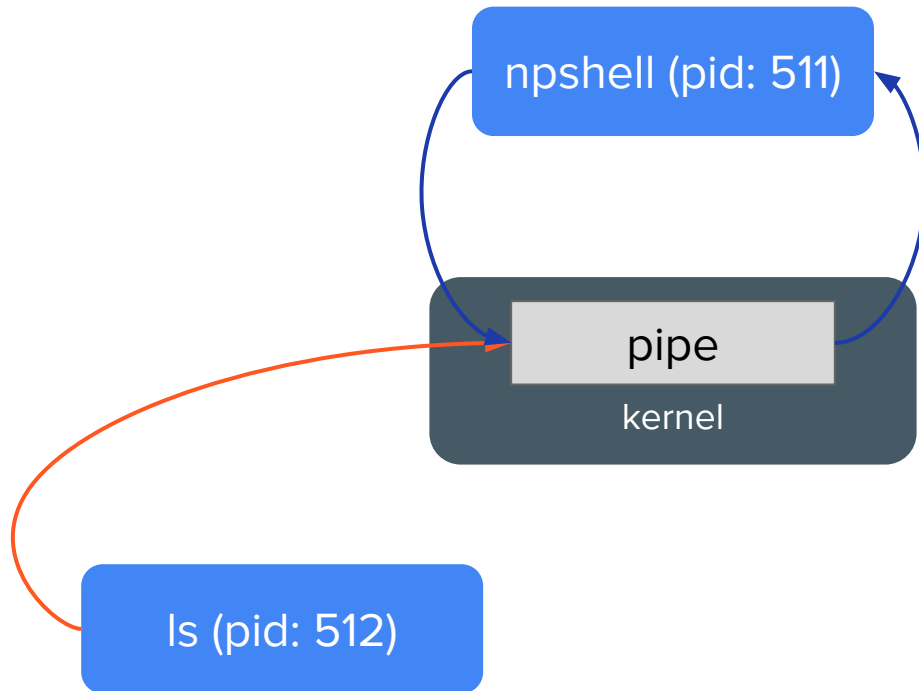
Pipe Between Processes - fork



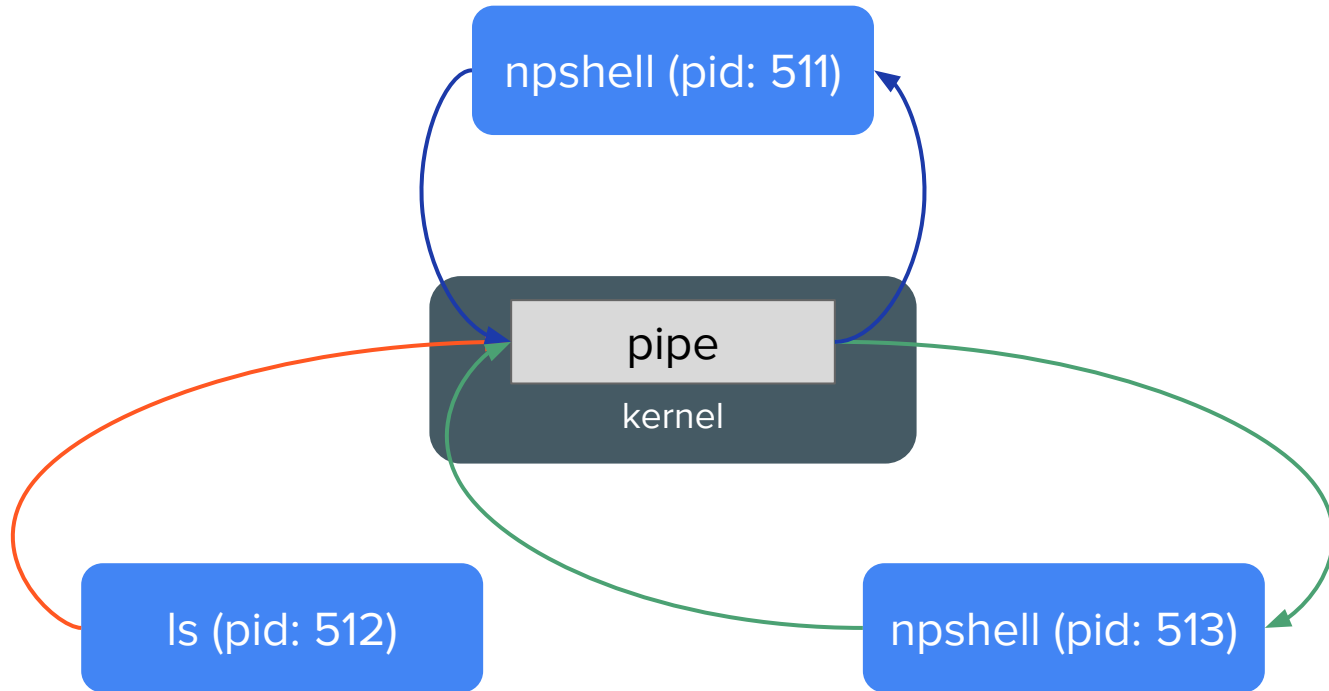
Pipe Between Processes - close



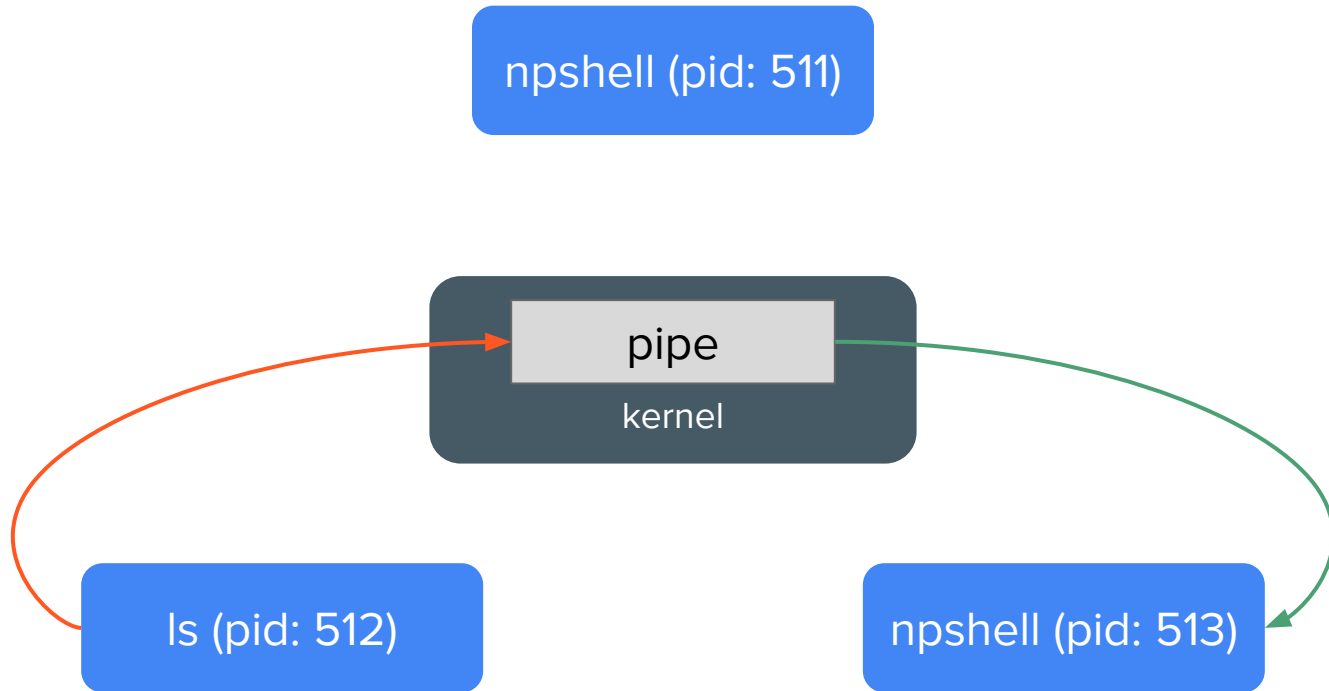
Pipe Between Processes - exec



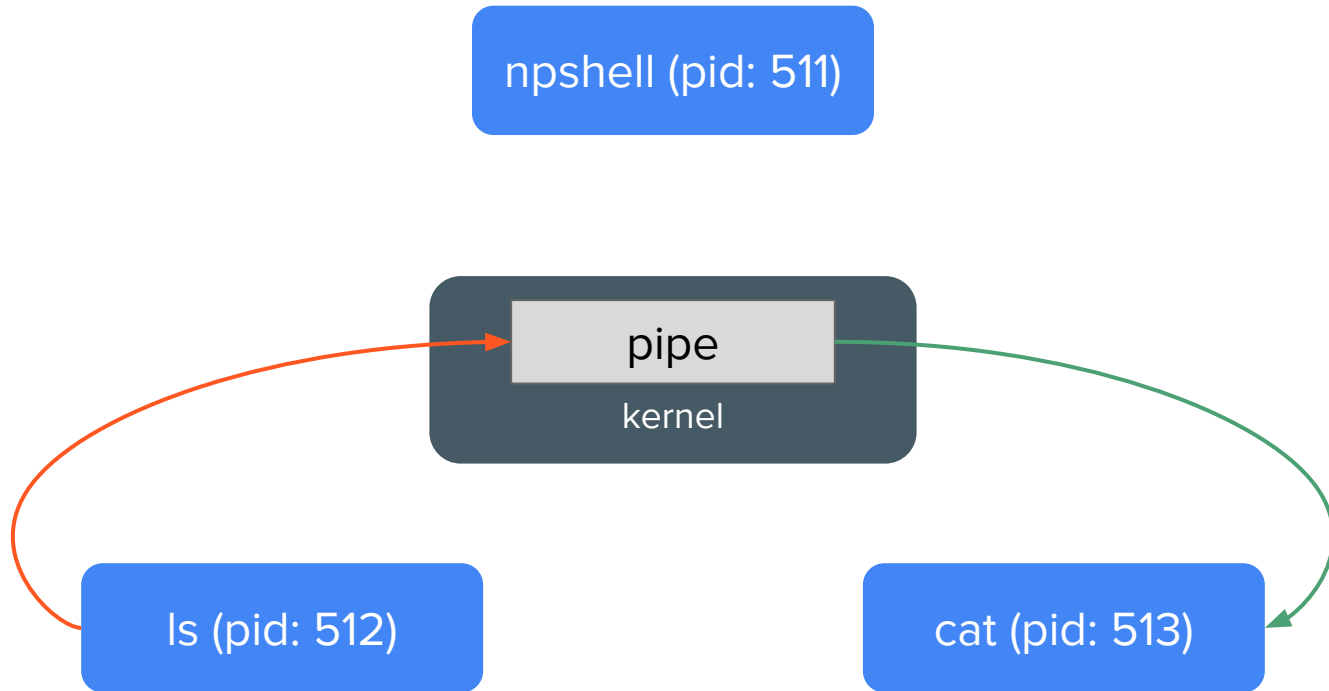
Pipe Between Processes - fork



Pipe Between Processes - close



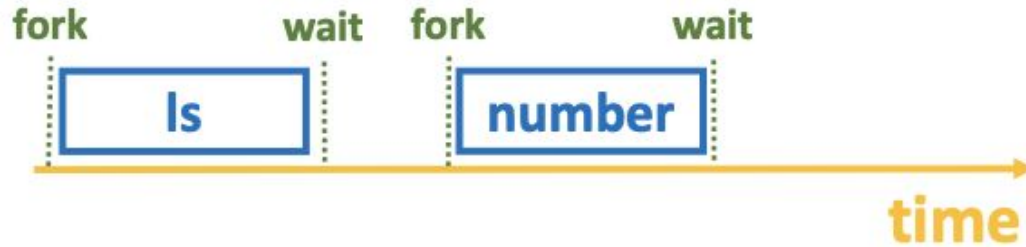
Pipe Between Processes - exec



Issues

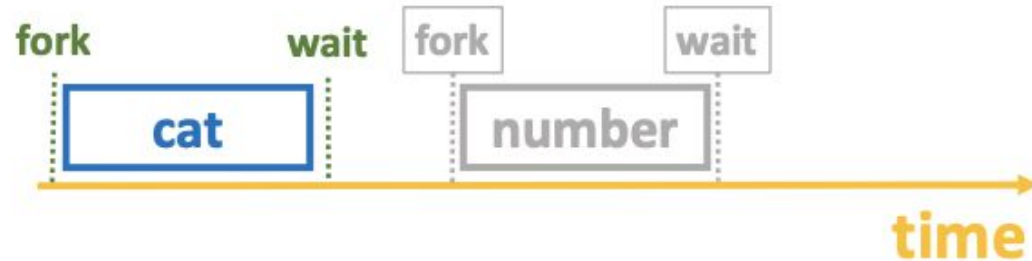
Implementation: Wait for each child process

% ls | number



Problem: Unable to process large data

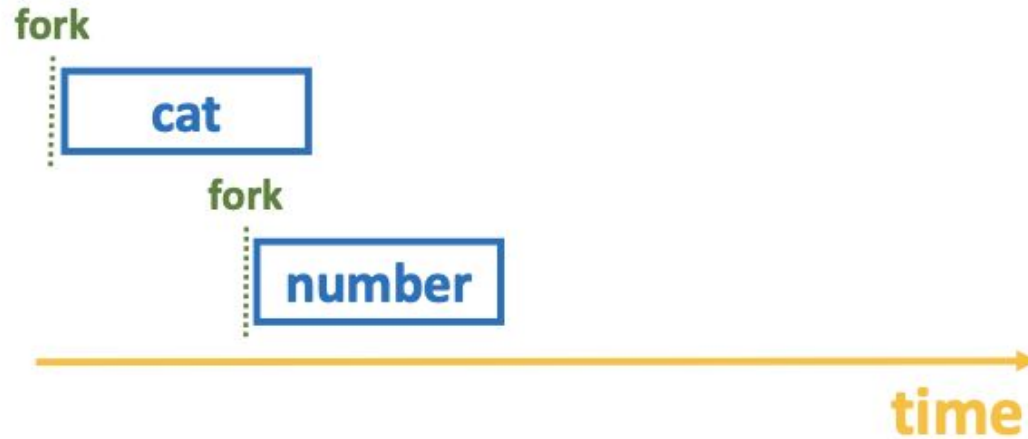
```
% cat largeFile.txt | number % cat largeFile.txt | 1  
% number
```



The process will hang forever !

Implementation: Never wait for child processes

```
% cat largeFile.txt | number
```



Problem: Prompt ordering and zombie processes

% ls
% bin test.html

% fork



%



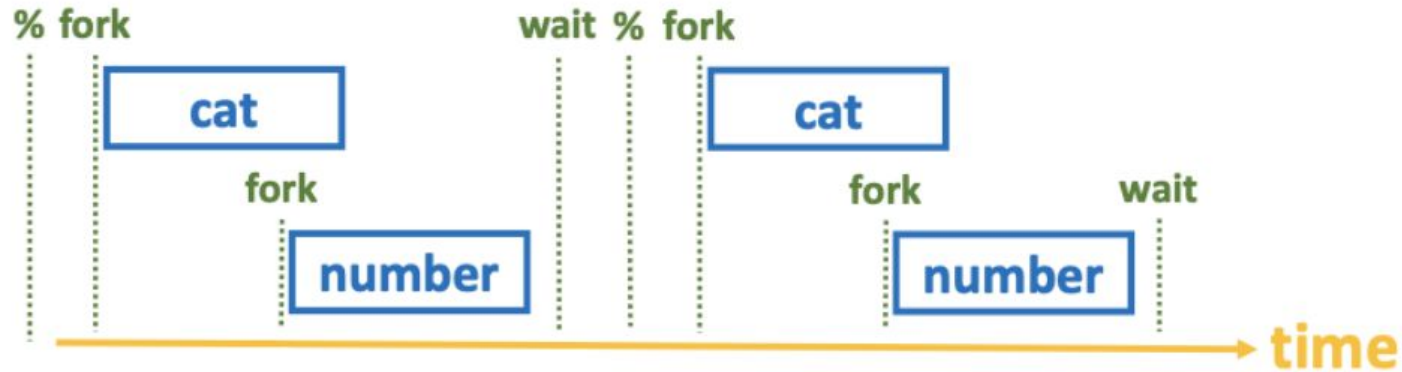
time

Correct:

```
% ls
bin test.html
%
```

Implementation: Wait for all piped commands together

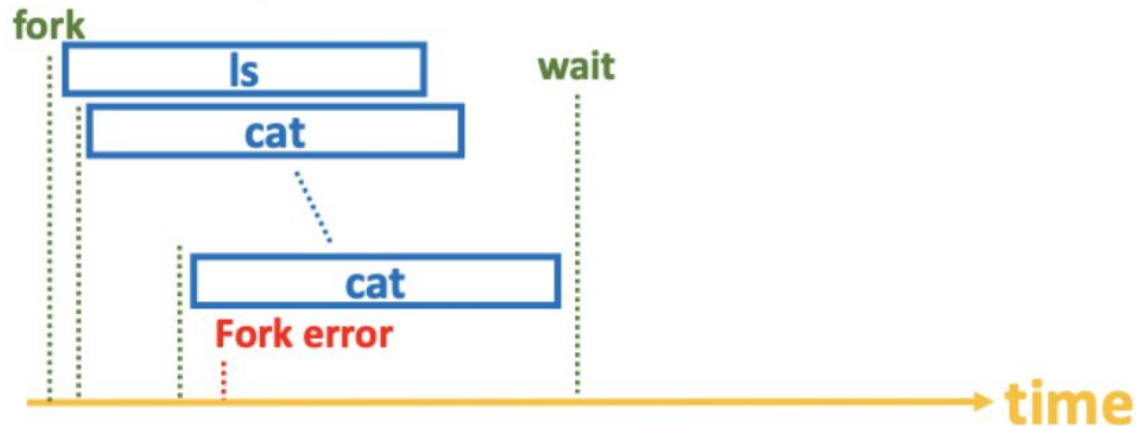
```
% cat largeFile.txt | number  
% cat largeFile.txt | 1  
% number
```



Problem: Process limitation

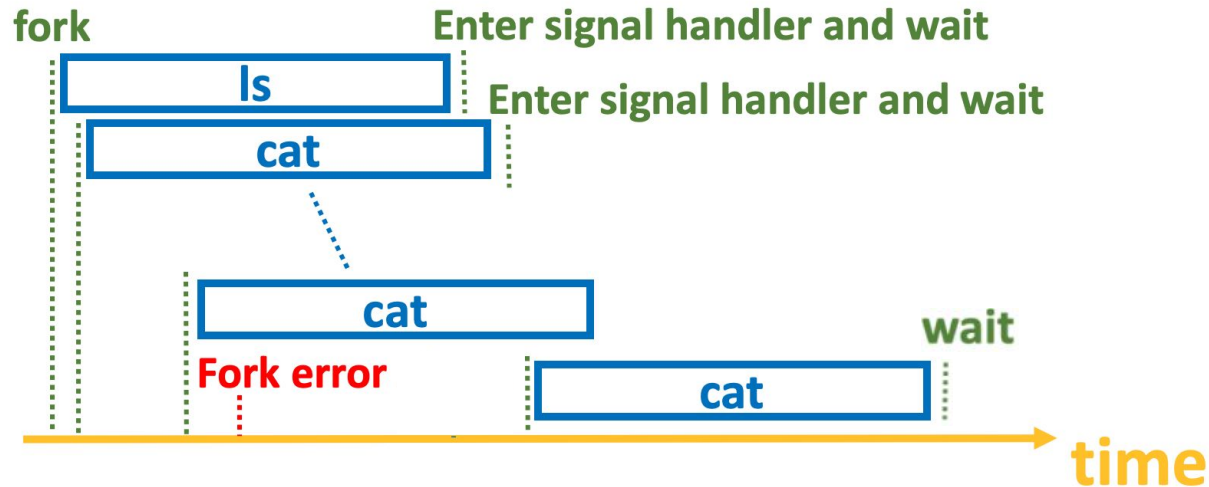
Suppose the process limit is **512** and the number of piped commands is **1000**...

ls | cat | cat | cat | cat cat | cat



One Possible Implementation: Use signal handler

ls | cat | cat | cat | cat cat | cat



Hints

- Think about when the npshell should wait the child process
- Try to understand the concept of parent/child processes, zombie processes, SIGCHLD, and signal handler
- Failure (e.g., fork error) needs to be handled

Hints

- Functions you may use
 - fork
 - pipe
 - dup, dup2
 - close
 - exec*
 - wait, waitpid
 - signal
 - setenv
 - getenv