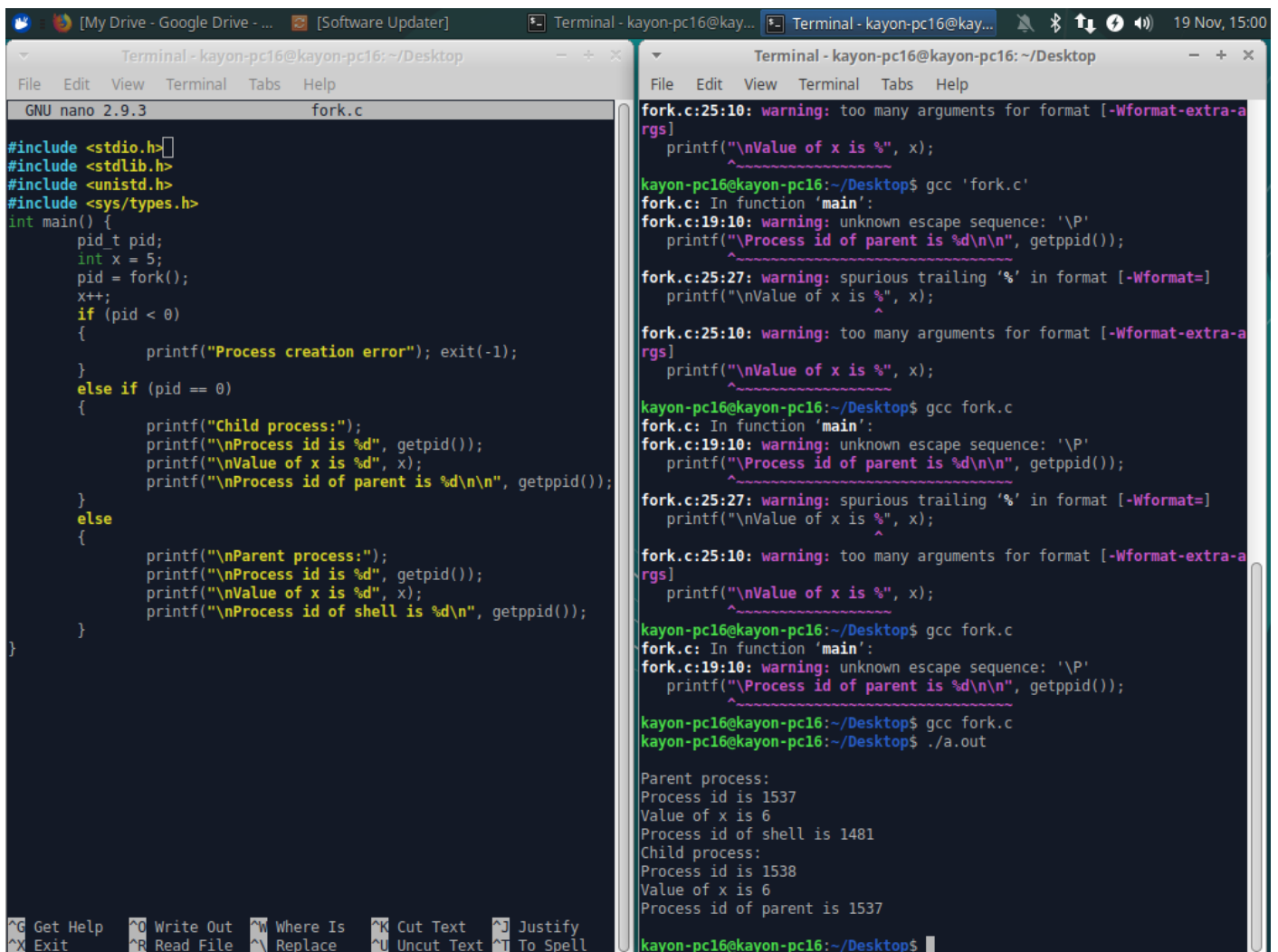


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MODUL 8

1. Membuat child "Child Process" dengan menggunakan System Call "Fork"



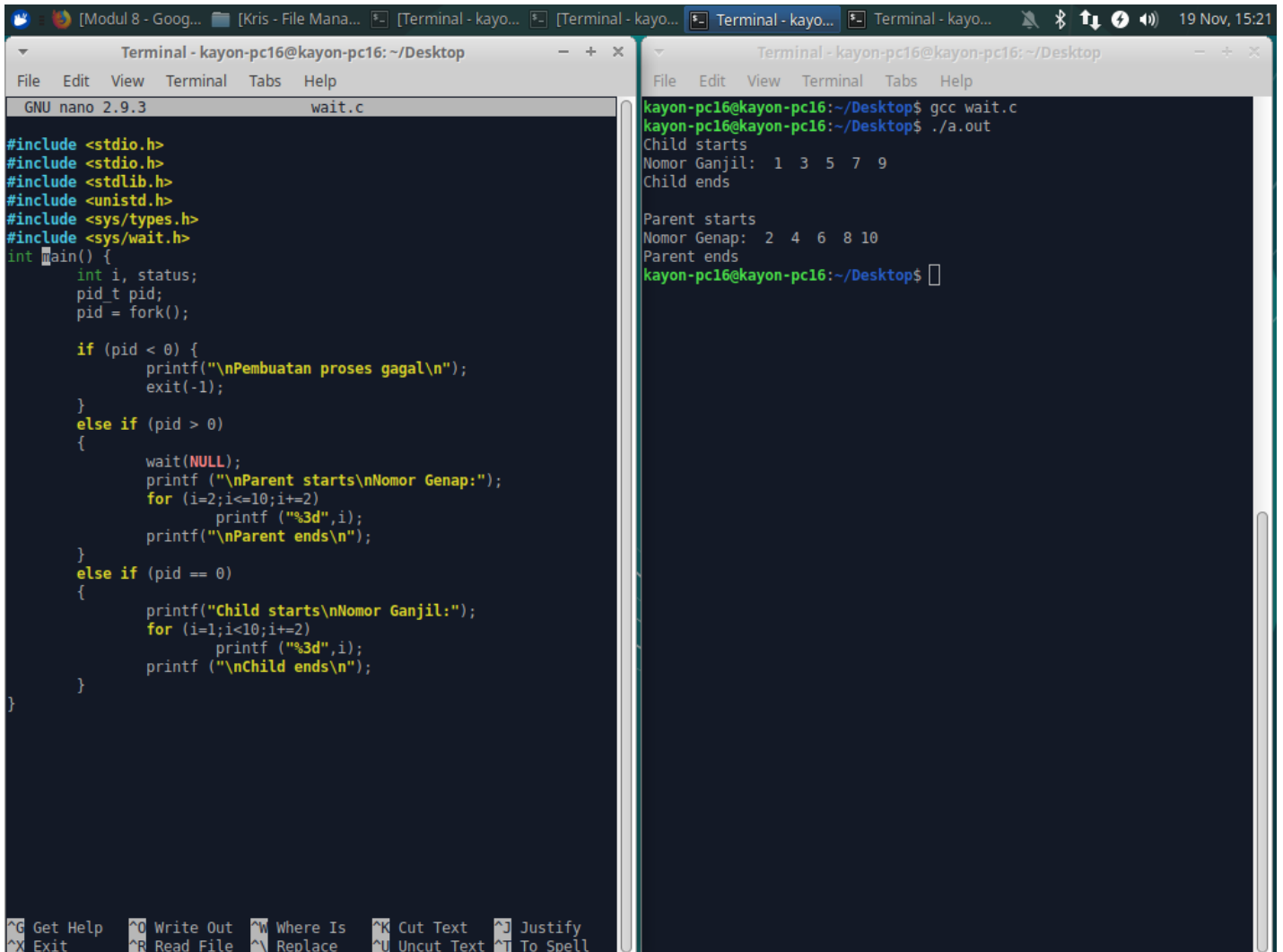
```
GNU nano 2.9.3 fork.c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/types.h>
int main() {
    pid_t pid;
    int x = 5;
    pid = fork();
    x++;
    if (pid < 0)
    {
        printf("Process creation error"); exit(-1);
    }
    else if (pid == 0)
    {
        printf("Child process:");
        printf("\nProcess id is %d", getpid());
        printf("\nValue of x is %d", x);
        printf("\nProcess id of parent is %d\n", getppid());
    }
    else
    {
        printf("\nParent process:");
        printf("\nProcess id is %d", getpid());
        printf("\nValue of x is %d", x);
        printf("\nProcess id of shell is %d\n", getppid());
    }
}
```

```
fork.c:25:10: warning: too many arguments for format [-Wformat-extra-args]
    printf("\nValue of x is %", x);
           ^
kayon-pc16@kayon-pc16:~/Desktop$ gcc 'fork.c'
fork.c: In function 'main':
fork.c:19:10: warning: unknown escape sequence: '\P'
    printf("\Process id of parent is %d\n\n", getppid());
           ^
fork.c:25:27: warning: spurious trailing '%' in format [-Wformat=]
    printf("\nValue of x is %", x);
                           ^
fork.c:25:10: warning: too many arguments for format [-Wformat-extra-args]
    printf("\nValue of x is %", x);
           ^
kayon-pc16@kayon-pc16:~/Desktop$ gcc fork.c
fork.c: In function 'main':
fork.c:19:10: warning: unknown escape sequence: '\P'
    printf("\Process id of parent is %d\n\n", getppid());
           ^
fork.c:25:27: warning: spurious trailing '%' in format [-Wformat=]
    printf("\nValue of x is %", x);
                           ^
fork.c:25:10: warning: too many arguments for format [-Wformat-extra-args]
    printf("\nValue of x is %", x);
           ^
kayon-pc16@kayon-pc16:~/Desktop$ gcc fork.c
kayon-pc16@kayon-pc16:~/Desktop$ ./a.out

Parent process:
Process id is 1537
Value of x is 6
Process id of shell is 1481
Child process:
Process id is 1538
Value of x is 6
Process id of parent is 1537

kayon-pc16@kayon-pc16:~/Desktop$
```

2. Menghentikan sementara (block) proses parent dengan proses child selesai, menggunakan system call "wait"



The image shows two terminal windows side-by-side. The left window is a nano editor editing a file named `wait.c`. The code is as follows:

```
#include <stdio.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/wait.h>
int main() {
    int i, status;
    pid_t pid;
    pid = fork();

    if (pid < 0) {
        printf("\nPembuatan proses gagal\n");
        exit(-1);
    }
    else if (pid > 0)
    {
        wait(NULL);
        printf ("\nParent starts\nNomor Genap:");
        for (i=2;i<=10;i+=2)
            printf ("%3d",i);
        printf("\nParent ends\n");
    }
    else if (pid == 0)
    {
        printf("Child starts\nNomor Ganjil:");
        for (i=1;i<10;i+=2)
            printf ("%3d",i);
        printf ("\nChild ends\n");
    }
}
```

The right window shows the execution of the program. It starts with the compilation command `gcc wait.c` and the execution command `./a.out`. The output shows the child process starting first, printing odd numbers from 1 to 9, and then the parent process starting, printing even numbers from 2 to 10. This demonstrates that the parent process was blocked until the child process completed its execution.

```
kayon-pc16@kayon-pc16:~/Desktop$ gcc wait.c
kayon-pc16@kayon-pc16:~/Desktop$ ./a.out
Child starts
Nomor Ganjil:  1  3  5  7  9
Child ends

Parent starts
Nomor Genap:  2  4  6  8 10
Parent ends
kayon-pc16@kayon-pc16:~/Desktop$
```

3. Loading Program yang dapat dieksekusi dalam sebuah “Child” Proses menggunakan perintah system call “exec”

```
Terminal - kayon-pc25@kayon-pc25: ~
File Edit View Terminal Tabs Help

root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~  root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~  root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~

kayon-pc25@kayon-pc25:~$ gcc exec.c
exec.c:5:1: warning: return type defaults to 'int' [-Wimplicit-int]
main(int argc, char*argv[]) {
^
exec.c: In function 'main':
exec.c:23:3: warning: missing sentinel in function call [-Wformat=]
    i = execl(argv[1], argv[2], 0);
    ^
exec.c:30:3: warning: implicit declaration of function 'wait'; did you mean 'main'? [-Wimplicit-function-declaration]
    wait(NULL);
    ^
main
kayon-pc25@kayon-pc25:~$ ./a.out /bin/ls ls
Child process
a.out Desktop Documents Downloads exec.c fork.c info1200180110.sh.save info1200180110.sh.save.1 Music Pictures Public Templates Videos wait.c
Child Terminated
kayon-pc25@kayon-pc25:~$ gcc exec.c
exec.c:5:1: warning: return type defaults to 'int' [-Wimplicit-int]
main(int argc, char*argv[]) {
^
exec.c: In function 'main':
exec.c:20:3: warning: missing sentinel in function call [-Wformat=]
    i = execl(argv[1], argv[2], 0);
    ^
exec.c:27:3: warning: implicit declaration of function 'wait'; did you mean 'main'? [-Wimplicit-function-declaration]
    wait(NULL);
    ^
main
kayon-pc25@kayon-pc25:~$ gcc exec.c
exec.c:5:10: fatal error: sys/wait.c: No such file or directory
#include <sys/wait.h>
         ^
compilation terminated.
kayon-pc25@kayon-pc25:~$ gcc exec.c
exec.c:6:1: warning: return type defaults to 'int' [-Wimplicit-int]
main(int argc, char*argv[]) {
^
kayon-pc25@kayon-pc25:~$ gcc exec.c
kayon-pc25@kayon-pc25:~$ ./a.out /bin/ls ls
Child process
a.out Desktop Documents Downloads exec.c fork.c info1200180110.sh.save info1200180110.sh.save.1 Music Pictures Public Templates Videos wait.c
Child Terminated
kayon-pc25@kayon-pc25:~$
```

```
Terminal - root@kayon-pc25: /home/kayon-pc25
File Edit View Terminal Tabs Help

root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~  root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~  root@kayon-pc25: /home/kay...  kayon-pc25@kayon-pc25: ~

GNU nano 2.9.3 exec.c
#include <stdio.h>
#include <sys/types.h>
#include <unistd.h>
#include <stdlib.h>
#include <sys/wait.h>
int main(int argc, char*argv[]) {
    pid_t pid;
    int i;
    if (argc != 3)
    {
        printf("\nInsufficient arguments to load program");
        printf("\nUsage: ./a.out <path> <cmd>\n"); exit(-1);
    }
    switch(pid = fork())
    {
        case -1:
            printf("Fork failed");
            exit(-1);
        case 0:
            printf("Child process\n");
            i = execl(argv[1], argv[2], NULL);
            if (i < 0)
            {
                printf("\n%s program not loaded using exec system call\n", argv[2]);
                exit(-1);
            }
        default:
            wait(NULL);
            printf("Child Terminated\n");
            exit(-1);
    }
}
```

4. Menambahkan status file menggunakan perintha system call “stat”

```
GNU nano 2.9.3 stat.c
#include <stdio.h>
#include <sys/stat.h>
#include <stdlib.h>
#include <time.h>

int main(int argc, char*argv[]) {
    struct stat
    file; int n;
    if (argc != 2)
    {
        printf("Usage: ./a.out <filename>\n"); exit(-1);
    }
    if ((n = stat(argv[1], &file)) == -1)
    {
        perror(argv[1]);
        exit(-1);
    }
    printf("User id : %d\n", file.st_uid);
    printf("Group id : %d\n", file.st_gid);
    printf("Block size : %d\n", file.st_blksize);
    printf("Blocks allocated : %d\n", file.st_blocks);
    printf("Inode no. : %d\n", file.st_ino);
    printf("Last accessed : %s", ctime(&(file.st_atime)));
    printf("Last modified : %s", ctime(&(file.st_mtime)));
    printf("File size : %d bytes\n", file.st_size);
    printf("No. of links : %d\n", file.st_nlink);
    printf("Permission : ");
    printf("\n");
    printf("File type : Regular\n");
    return 0;
}
```

```
GNU nano 2.9.3 stat.c
    perror(argv[1]);
    exit(-1);
}
printf("User id : %d\n", file.st_uid);
printf("Group id : %d\n", file.st_gid);
printf("Block size : %d\n", file.st_blksize);
printf("Blocks allocated : %d\n", file.st_blocks);
printf("Inode no. : %d\n", file.st_ino);
printf("Last accessed : %s", ctime(&(file.st_atime)));
printf("Last modified : %s", ctime(&(file.st_mtime)));
printf("File size : %d bytes\n", file.st_size);
printf("No. of links : %d\n", file.st_nlink);
printf("Permission : ");
printf(" (%s) ", file.st_mode & S_IFMT);
printf(" (%s) ", file.st_mode & S_IRUSR);
printf(" (%s) ", file.st_mode & S_IWUSR);
printf(" (%s) ", file.st_mode & S_IXUSR);
printf(" (%s) ", file.st_mode & S_IRGRP);
printf(" (%s) ", file.st_mode & S_IWGRP);
printf(" (%s) ", file.st_mode & S_IXGRP);
printf(" (%s) ", file.st_mode & S_IROTH);
printf(" (%s) ", file.st_mode & S_IWOTH);
printf(" (%s) ", file.st_mode & S_IXOTH);
printf("\n");
if(file.st_mode & S_IFREG)
    printf("File type : Regular\n");
else if(file.st_mode & S_IFDIR)
    printf("File type : Directory\n");
else if(file.st_mode & S_IFCHR)
    printf("File type : Character\n");
else if(file.st_mode & S_IFBLK)
    printf("File type : Block\n");
else if(file.st_mode & S_IFIFO)
    printf("File type : FIFO\n");
else if(file.st_mode & S_IFLNK)
    printf("File type : Symbolic link\n");
else if(file.st_mode & S_IFSOCK)
    printf("File type : Socket\n");
else
    printf("File type : Unknown\n");
return 0;
}
```

```
GNU nano 2.9.3 stat.c
printf(" (%s) ", file.st_mode & S_IFMT);
printf(" (%s) ", file.st_mode & S_IRUSR);
printf(" (%s) ", file.st_mode & S_IWUSR);
printf(" (%s) ", file.st_mode & S_IXUSR);
printf(" (%s) ", file.st_mode & S_IRGRP);
printf(" (%s) ", file.st_mode & S_IWGRP);
printf(" (%s) ", file.st_mode & S_IXGRP);
printf(" (%s) ", file.st_mode & S_IROTH);
printf(" (%s) ", file.st_mode & S_IWOTH);
printf(" (%s) ", file.st_mode & S_IXOTH);
printf("\n");
if(file.st_mode & S_IFREG)
    printf("File type : Regular\n");
else if(file.st_mode & S_IFDIR)
    printf("File type : Directory\n");
else if(file.st_mode & S_IFCHR)
    printf("File type : Character\n");
else if(file.st_mode & S_IFBLK)
    printf("File type : Block\n");
else if(file.st_mode & S_IFIFO)
    printf("File type : FIFO\n");
else if(file.st_mode & S_IFLNK)
    printf("File type : Symbolic link\n");
else if(file.st_mode & S_IFSOCK)
    printf("File type : Socket\n");
else
    printf("File type : Unknown\n");
return 0;
}
```

```
File type : Regular
fitria@fitria-VirtualBox:~$ gcc stat.c
fitria@fitria-VirtualBox:~$ ./a.out
Usage: ./a.out <filename>
fitria@fitria-VirtualBox:~$ gcc stat.c
fitria@fitria-VirtualBox:~$ ./a.out stat.c
User id : 0
Group id : 0
Block size : 4096
Blocks allocated : 8
Inode no. : 555318
Last accessed : Thu Nov 21 21:09:24 2019
Last modified : Thu Nov 21 21:09:16 2019
File size : 1375 bytes
No. of links : 1
Permission : -rw-r--r--
File type : Regular
fitria@fitria-VirtualBox:~$ gcc stat.c
fitria@fitria-VirtualBox:~$ ./a.out stat.c
User id : 0
Group id : 0
Block size : 4096
Blocks allocated : 8
Inode no. : 555318
Last accessed : Thu Nov 21 21:09:24 2019
Last modified : Thu Nov 21 21:09:16 2019
File size : 1375 bytes
No. of links : 1
Permission : -rw-r--r--
File type : Regular
fitria@fitria-VirtualBox:~$
```

5. Menampilkan isi direktori menggunakan perintah system call “readdir”

```
GNU nano 2.9.3                                dirlist.c

#include <stdio.h>
#include <dirent.h>
#include <stdlib.h>
int main(int argc, char*argv[]){
    struct dirent *dptr;
    DIR *dname;

    if (argc != 2)
    {
        printf("Usage: ./a.out <dirname>\n");
        exit(-1);
    }
    if((dname = opendir(argv[1])) == NULL)
    {
        perror(argv[1]);
        exit(-1);
    }
    while(dptr=readdir(dname))
        printf("%s\n", dptr->d_name);

    closedir(dname);
}

Wrote 22 lines
Get Help  Write Out  Where Is  Cut Text  Justify  Cur Pos  Undo  Mark Text  To Bracket
Exit      Read File  Replace  Uncut Text  To Spell  Go To Line  Redo  Copy Text  Where's Next
Activate Windows
Go to Settings to activate Windows.
```

```
fitria@fitria-VirtualBox:~$ gcc dirlist.c
fitria@fitria-VirtualBox:~$ ./a.out dirlist.c
User id : 0
Group id : 0
Block size : 4096
Blocks allocated : 8
Inode no. : 530210
Last accessed : Thu Nov 21 21:17:00 2019
Last modified : Thu Nov 21 21:16:54 2019
File size : 360 bytes
No. of links : 1
Permission : -rw-r--r--
File type : Regular
fitria@fitria-VirtualBox:~$ ./a.out Downloads
.
..
google-chrome-stable_current_amd64.deb
fitria@fitria-VirtualBox:~$ ./a.out Pictures
Screenshot from 2019-11-09 14-45-38.png
.
..
Screenshot from 2019-11-09 14-48-13.png
Screenshot from 2019-11-09 14-48-33.png
fitria@fitria-VirtualBox:~$
```