xv6: Adding a user program

1. We want to run the following user program in xv6 (i.e. we want to execute it from xv6 shell):

```c
#include <stdio.h>

int main()
{
   printf("hello world\n");

   int num;
   scanf("%d", &num);
   printf("%d^2 = %d\n", num, num * num);

   return 0;
}
```

We cannot directly write a program like this in xv6 because

- xv6 does not have the stdio.h library. All the library functions are declared in **user/user.h**.
- **user/user.h** does not have **scanf**.

For xv6, add the program becomes:

```c
#include "kernel/types.h"
#include "kernel/stat.h"
#include "user/user.h"

int main()
{
   printf("hello world\n");
   char buf[10];
   gets(buf, 9);
   int num = atoi(buf);

   printf("%d^2 = %d\n", num, num * num);

   return 0;
}
```

Here, we can see two other files being imported: **kernel/types.h** and **kernel/stat.h**. This is because **user/user.h** depends on them.
Also, **scanf** is simulated using **gets** and **atoi**.

2. Now, save this code as **myprog.c** inside the folder **user**.
   xv6 does not have a gcc compiler inside. The code needs to be precompiled into the OS image. For this, edit the **UPROGS** variable in **Makefile** as follows.

```
UPROGS=\
    $U/_cat\
    $U/_echo\
    $U/_forktest\
    $U/_grep\
    $U/_init\
    $U/_kill\
    $U/_ln\
    $U/_ls\
    $U/_mkdir\
    $U/_myprog\ # add this line
    $U/_rm\
    $U/_sh\
    $U/_stressfs\
    $U/_usertests\
    $U/_grind\
    $U/_wc\
    $U/_zombie\
```

3. Run
   make clean
   make qemu

4. Call the command **myprog** in shell and you will get the following output.

```
$ myprog
hello world
3
3^2 = 9
$
```