Project 5 SQL Injection Attack

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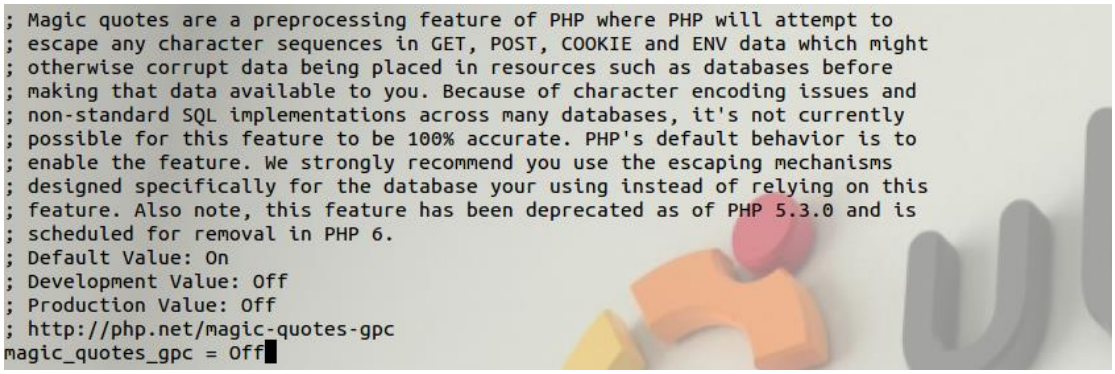
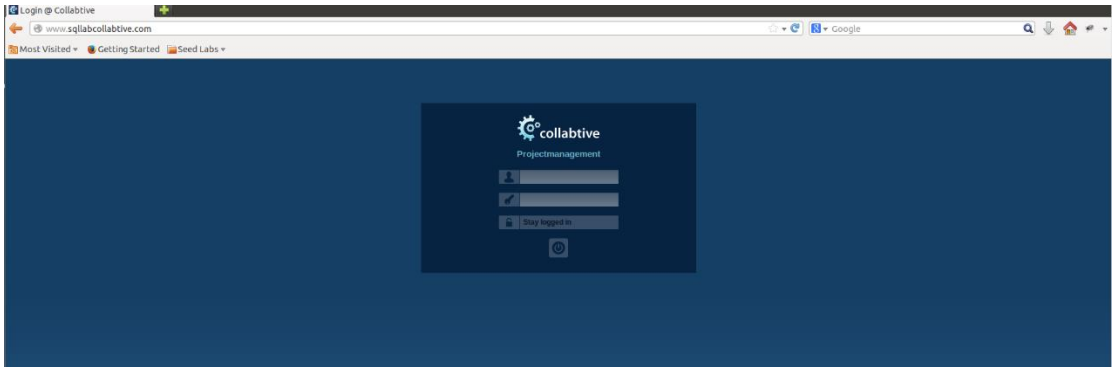
Task 1 SQL Injection Attack on SELECT Statements

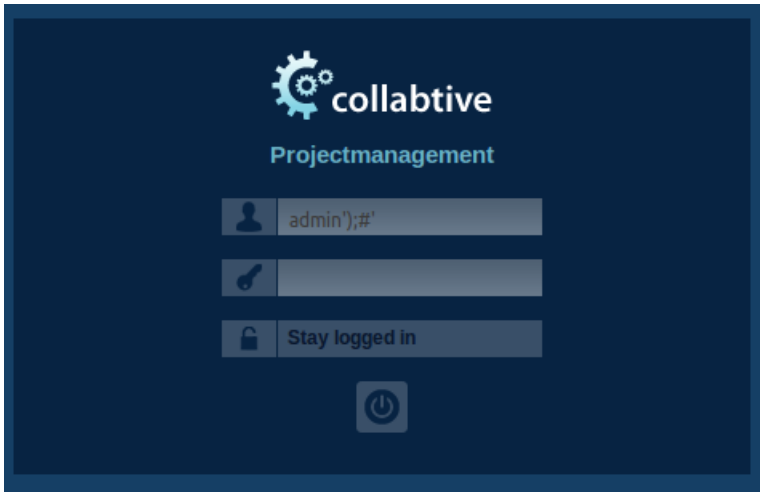
Before task1, we should first turn off the countermeasure. Then restart Apache server.

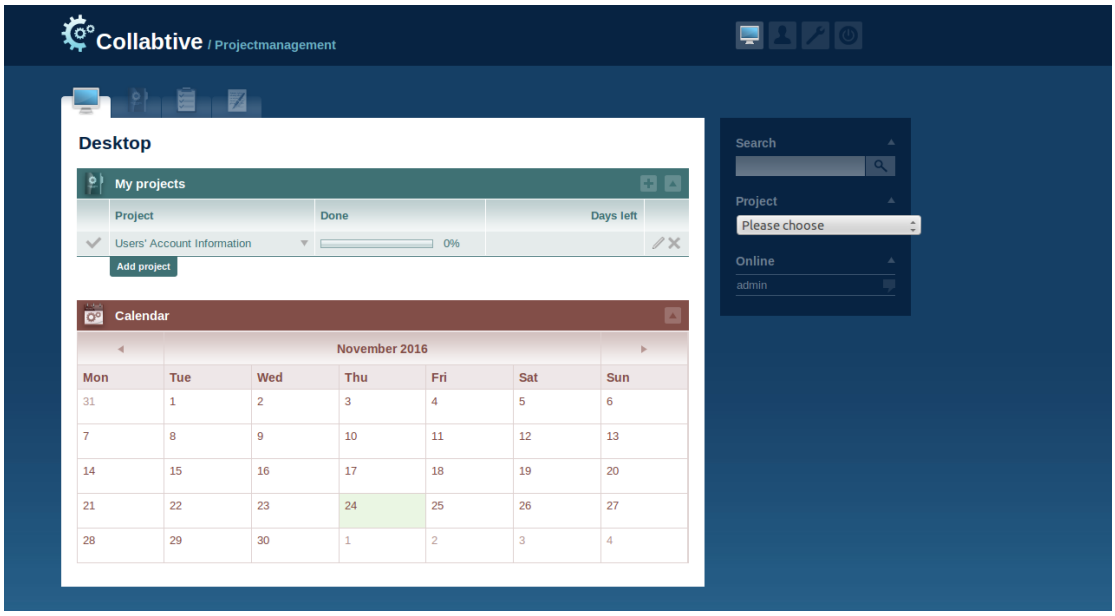


Task 1.1: Can you log into another person's account without knowing the correct password?

Yes, we can.







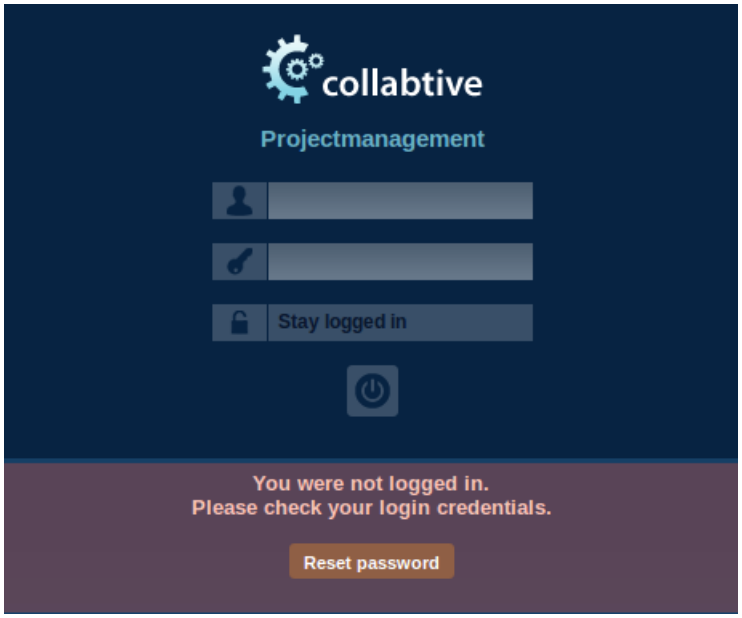
From above we can see that we have logged in without knowing the correct password.
This is because the query statement in the class.user.php file is:

```
$sel1 = mysql_query("SELECT ID,name,locale,lastlogin,gender FROM user WHERE (name = '$user' OR email = '$user') AND pass = '$pass'");
$chk = mysql_fetch_array($sel1);
```

This statement is susceptible to injection attack.

Task 1.2: Can you find a way to modify the database (still using the above SQL query)?

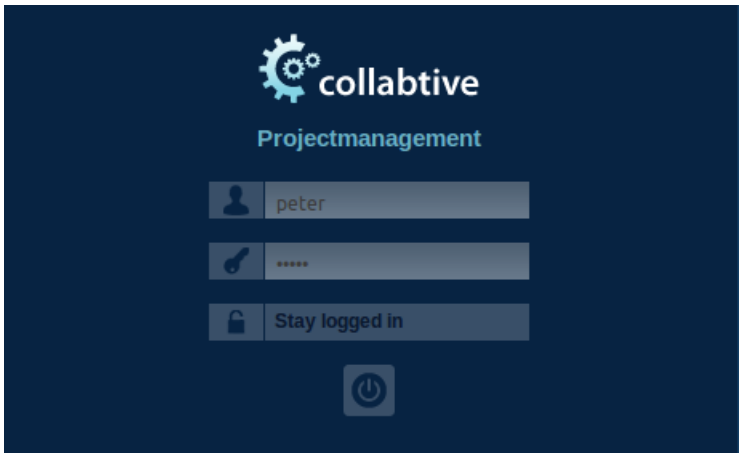
No, we can't. I tried but failed to modify the database.
Write "admin'); UPDATE user SET pass='new' WHERE name='admin'; # ' "in the user input field.



We can see that we can't execute two separate SQL statement. Because in php function mysql_query() it's not allowed to execute two separate SQL statements.

Task 2: SQL Injection on UPDATE Statements

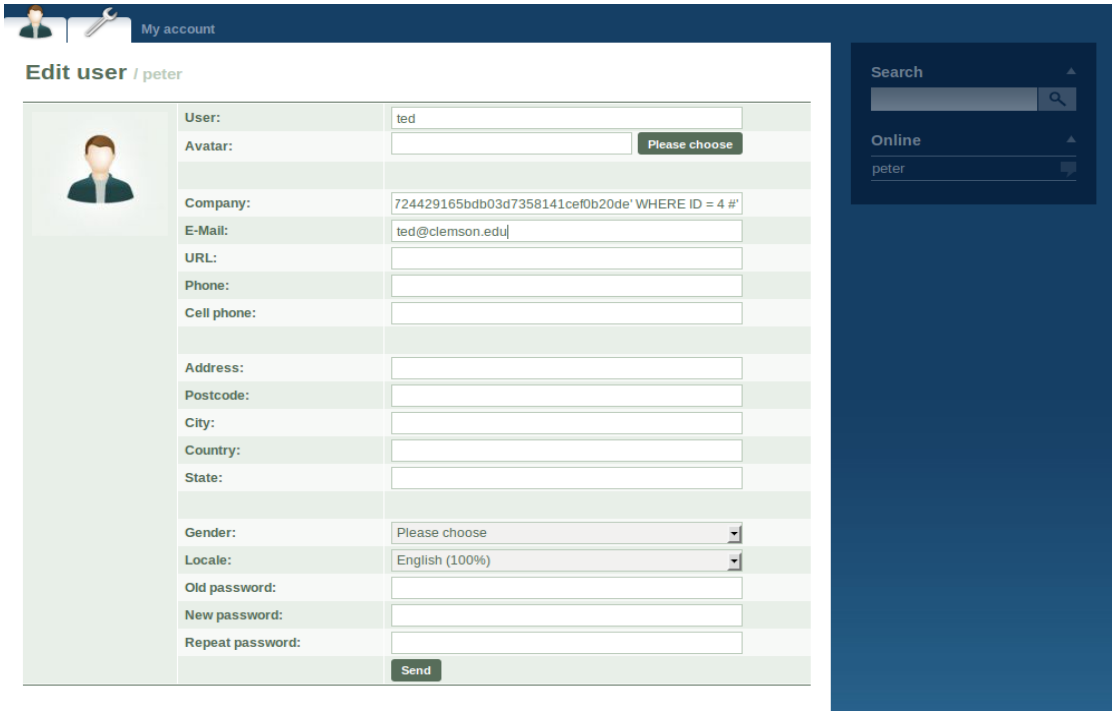
Log in as user peter.



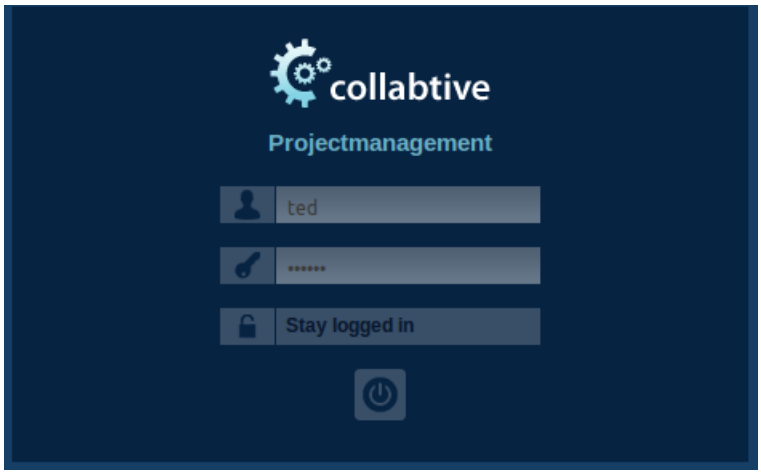
```
    */
    function edit($id, $name, $realname, $email, $tel1, $tel2, $company, $zip, $gender, $url, $address1, $address2, $state, $country, $tags, $locale, $avatar = "", $rate = 0.0)
    {
        $name = mysql_real_escape_string($name);
        $realname = mysql_real_escape_string($realname);

//modifled for SQL Lab
            //$company = mysql_real_escape_string($company);
        $email = mysql_real_escape_string($email);
        $tel1 = mysql_real_escape_string($tel1);
        $tel2 = mysql_real_escape_string($tel2);
        $zip = mysql_real_escape_string($zip);
        $gender = mysql_real_escape_string($gender);
        $url = mysql_real_escape_string($url);
        $address1 = mysql_real_escape_string($address1);
        $address2 = mysql_real_escape_string($address2);
        $state = mysql_real_escape_string($state);
        $country = mysql_real_escape_string($country);
        $tags = mysql_real_escape_string($tags);
        $locale = mysql_real_escape_string($locale);
        $avatar = mysql_real_escape_string($avatar);

        $rate = (float) $rate;
        $id = (int) $id;

        if ($avatar != "")
        {
            $upd = mysql_query("UPDATE user SET name='$name',email='$email',tel1='$tel1',
tel2='$tel2',company='$company',zip='$zip',gender='$gender',url='$url',adress='$address1',adress2='$address2',state='$state',country='$country',tags='$tags',locale='$locale',avatar='$avatar',rate='$rate'
WHERE ID = $id");
        }
        else
        {
            $upd = mysql_query("UPDATE user SET name='$name',email='$email', tel1='$tel1', tel2='$tel2',
company='$company',zip='$zip',gender='$gender',url='$url',adress='$address1',adress2='$address2',state='$state',country='$country',tags='$tags',locale='$locale',rate='$rate' WHERE ID = $id");
        }
        if ($upd)
        {
            $this->mylog->add($name, 'user', 2, 0);
            return true;
        }
```

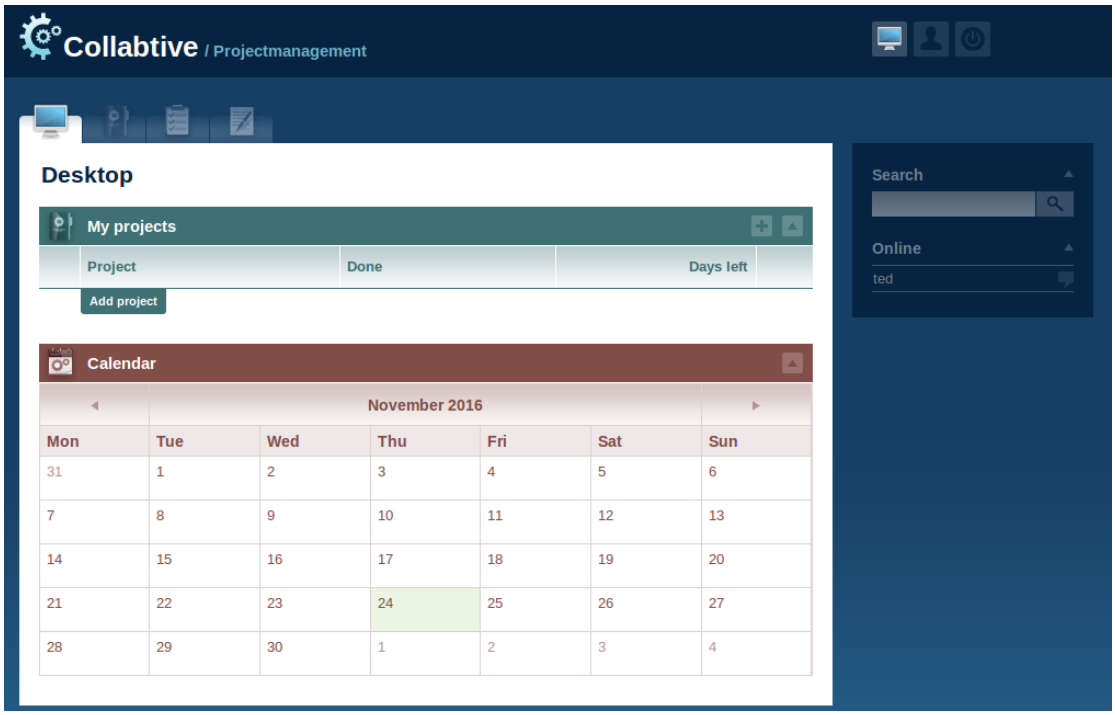
As we can see in class.user.php, the variable $company can be used for injection because the escape statement has been modified by the author.

In the edit page, edit peter's profile like below:(we find that the id of ted is 4 and we can calculate the sha1() value of "newted" is 430821196724429165bdb03d7358141cef0b20de.



After click send button. We log out from peter's account and log in as ted using new password.



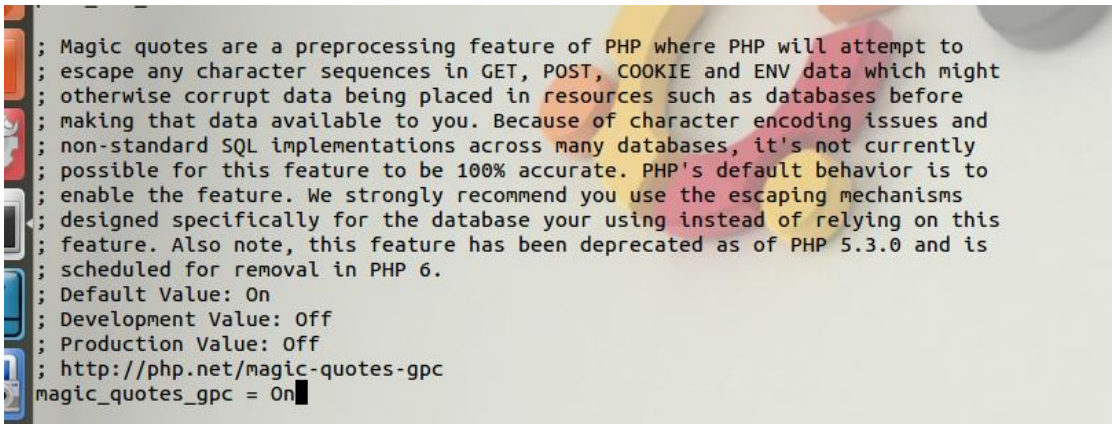


From above we can see that we can log in using ted's new password "newted". And it illustrates we successfully accomplish SQL injection on UPDATE statement.

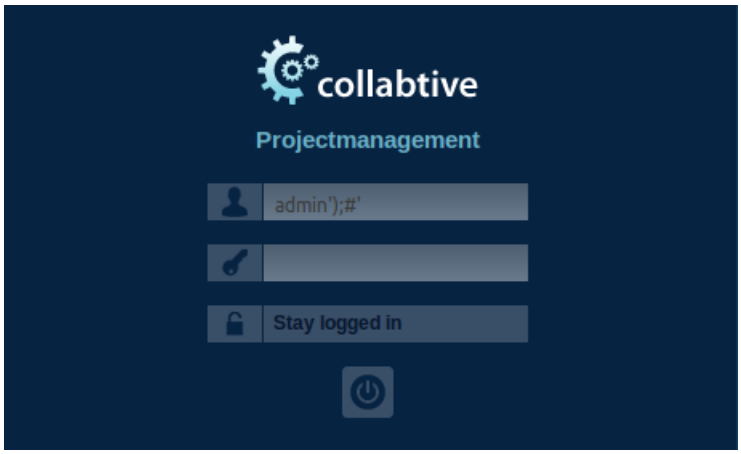
Task 3: Countermeasures

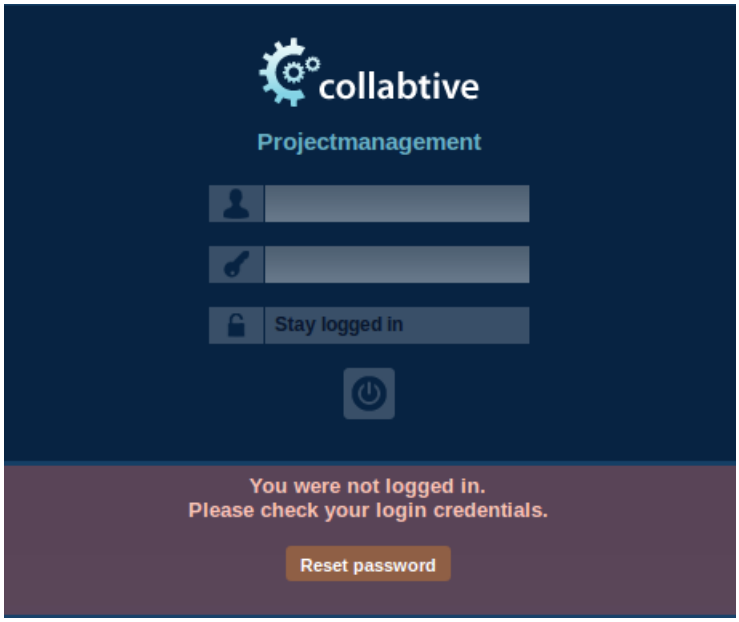
Task 3.1: Escaping Special Characters using magic quotes gpc.

Turn on magic_quotes_gpc



Save the change and restart apache server.
Log in using the method of Task1.





We can see the result is different. We can't log in without the correct password any more. Because with magic_quotes_gpc turned on, it will automatically escape any ' or " or \ or other null characters.

Task 3.2: Escaping Special Characters using mysql real escape string.

MySQL provides an escaping mechanism, called mysql_real_escape_string(), which prepends backslashes to a few special characters, including \x00, \n, \r, \, ', " and \x1A.
We can edit the class.user.php using this method.

```
    function login($user, $pass)
    {
        if (!$user)
        {
            return false;
        }

//modified for SQL Lab
        $user = mysql_real_escape_string($user);
        $pass = mysql_real_escape_string($pass);
        $pass = sha1($pass);

        $sel1 = mysql_query("SELECT ID,name,locale,lastlogin,gender FROM user WHERE (name = '$user' OR email = '$user') AND pass = '$pass'");
        $chk = mysql_fetch_array($sel1);
```

```
    function edit($id, $name, $realname, $email, $tel1, $tel2, $company, $zip, $gender, $url, $address1, $address2, $state, $country, $tags, $locale, $avatar = "", $rate = 0.0)
    {
        $name = mysql_real_escape_string($name);
        $realname = mysql_real_escape_string($realname);

//modified for SQL Lab
        $company = mysql_real_escape_string($company);
        $email = mysql_real_escape_string($email);
        $tel1 = mysql_real_escape_string($tel1);
        $tel2 = mysql_real_escape_string($tel2);
        $zip = mysql_real_escape_string($zip);
        $gender = mysql_real_escape_string($gender);
        $url = mysql_real_escape_string($url);
        $address1 = mysql_real_escape_string($address1);
        $address2 = mysql_real_escape_string($address2);
        $state = mysql_real_escape_string($state);
        $country = mysql_real_escape_string($country);
        $tags = mysql_real_escape_string($tags);
        $locale = mysql_real_escape_string($locale);
        $avatar = mysql_real_escape_string($avatar);
```

Task 3.3: Prepare Statement.

We can edit the class.user.php using this method.

```
   function login($user, $pass)
   {
       if (!$user)
       {
           return false;
       }

/modified for SQL Lab
*
       $user = mysql_real_escape_string($user);
       $pass = mysql_real_escape_string($pass);
       $pass = sha1($pass);

       $sel1 = mysql_query("SELECT ID,name,locale,lastlogin,gender FROM user WHERE (name = '$user' OR email = '$user') AND pass = '$pass'");
       $chk = mysql_fetch_array($sel1);
/
       $stmt = $conn->prepare("SELECT ID,name,locale,lastlogin,gender FROM user
                        WHERE (name=? OR email=?) AND pass=?");
       $stmt->bind_param("sss", $user, $user, sha1($pass));
        $stmt->execute();
        $stmt->bind_result($bind_ID, $bind_name, $bind_locale, $bind_lastlogin,
                    $bind_gender);
       $chk = $stmt->fetch();
```

In the edit() function, we can edit it as below:

```
        $country = mysql_real_escape_string($country);
        $tags = mysql_real_escape_string($tags);
        $locale = mysql_real_escape_string($locale);
        $avatar = mysql_real_escape_string($avatar);
*/
        $rate = (float) $rate;
        $id = (int) $id;

        if ($avatar != "")
        {
             $stmt = $conn->prepare("UPDATE user SET name=?, email=?, tel1=?,
                                    tel2=?, company=?, zip=?, gender=?, url=?,
                                    adress=?, adress2=?, state=?, country=?,
                                    tags=?, locale=?, avatar=? rate=?
                                    WHERE ID = ?");
            $stmt->bind_param("sssssssssssss", $name, $email, $tel1, $tel2,
                              $company, $zip, $gender, $url, $address1,
                              $address2, $state, $country, $tags, $locale,
                              $avatar, $rate, $id);
            $upd = $stmt->execute();
        }
        else
        {
            $stmt = $conn->prepare("UPDATE user SET name=?, email=?, tel1=?,
                                    tel2=?, company=?, zip=?, gender=?, url=?,
                                    adress=?, adress2=?, state=?, country=?,
                                    tags=?, locale=?, rate=? WHERE ID = ?");
            $stmt->bind_param("ssssssssssssssdi", $name, $email, $tel1, $tel2,
                              $company, $zip, $gender, $url, $address1,
                              $address2, $state, $country, $tags, $locale,
                              $rate, $id);
            $upd = $stmt->execute();
        }
        if ($upd)
        {
            $this->mylog->add($name, 'user', 2, 0);
            return true;
        }
        else
        {
            return false;
        }
```