

## Result

```
*****
Lab 6 Test Execution Start
*****

Fetching data from external resources and creating access control objects...
Successfully created user: SuperAdmin
Successfully created user: Admin1
Successfully created user: Manager1
Successfully created user: User1

--- Initial Users ---
Name: SuperAdmin, Level: SUPERUSER Level, Access Control Level: SUPERUSER, Access: ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIONS
Name: Admin1, Level: ADMIN Level, Access Control Level: ADMIN, Access: ADD/REMOVE USERS
Name: Manager1, Level: MANAGER Level, Access Control Level: MANAGER, Access: GENERATE/READ REPORTS
Name: User1, Level: USER Level, Access Control Level: USER, Access: DO_WORK
-----

--- Testing unique username constraint ---
ERROR: User with name 'Admin1' already exists. Cannot create user.
-----

--- Testing SUPERUSER view permission ---

--- SuperAdmin (SUPERUSER) is viewing all users ---
Name: User1, Level: USER Level, Access Control Level: USER, Access: DO_WORK
Name: Manager1, Level: MANAGER Level, Access Control Level: MANAGER, Access: GENERATE/READ REPORTS
Name: Admin1, Level: ADMIN Level, Access Control Level: ADMIN, Access: ADD/REMOVE USERS
Name: SuperAdmin, Level: SUPERUSER Level, Access Control Level: SUPERUSER, Access: ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIONS
--- End of user list ---

--- Testing non-SUPERUSER view permission ---

Admin1 does not have permission to view all users. Access Denied.

*****
Lab 6 Test Execution End
*****
```

The screenshot displays an IDE with the following components:

- Project Explorer:** Shows a project named 'lab6' with a source folder 'src' containing files: 'AccessControl', 'AccessControlProvider', 'Main', 'Prototype', 'TestPrototypePattern', 'User', and '.gitignore'.
- Code Editor:** Displays the 'TestPrototypePattern' class with the following code:

```
3 public class TestPrototypePattern {
4     public static void main(String[] args) {
5
6
7
8
9
10
11         if (superUser != null) {
12             superUser.viewAllUsers();
13         }
14
15         System.out.println("\n--- Testing non-SUPERUSER view permission ---");
16
17         if (adminUser != null) {
18             adminUser.viewAllUsers();
19         }
20
21         System.out.println("\n*****");
22         System.out.println("Lab 6 Test Execution End");
23         System.out.println("*****");
24     }
25 }
```
- Run Console:** Shows the output of the program execution, which matches the 'Result' section above. It includes the initial user creation, the unique username constraint test, the SUPERUSER view permission test, and the non-SUPERUSER view permission test.
- Performance:** A panel on the right side of the Run Console showing 'Show Results' and 'Process Termination'.

# Code changed

## Class AccessControlProvider

```
// new code added
map.put("SUPERUSER", new AccessControl( controlLevel: "SUPERUSER", access: "ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIONS, VIEW LOGS, VIEW OTHERS' ACCESS INFORMATION" ));
}
```

## Add method

```
public static User createUser(String userName, String level) { 5 usages

    if (userRegistry.containsKey(userName)) {
        System.out.println("ERROR: User with name '" + userName + "' already exists. Cannot create user.");
        return null;
    }

    AccessControl accessControl = getAccessControlObject(level);
    if (accessControl == null) {
        System.out.println("ERROR: Invalid user level '" + level + "'.");
        return null;
    }

    User newUser = new User(userName, level: level + " Level", accessControl);
    //
    userRegistry.put(userName, newUser);
    System.out.println("Successfully created user: " + userName);
    return newUser;
}

//
public static Collection<User> getAllUsers() { 1 usage
    return userRegistry.values();
}
```

## In User Class

## Add method

```
public void viewAllUsers() {
    if ("SUPERUSER".equals(this.getAccessControl().getControlLevel())) {
        System.out.println("\n--- " + this.userName + " (SUPERUSER) is viewing");
        Collection<User> allUsers = AccessControlProvider.getAllUsers();
        for (User u : allUsers) {
            System.out.println(u); // 使用现有的toString()方法打印用户信息
        }
        System.out.println("--- End of user list ---");
    } else {
        System.out.println("\n" + this.userName + " does not have permission to view all users");
    }
}
```

## Test Code

*// TestPrototypePattern.java*

```
public class TestPrototypePattern {

    public static void main(String[] args) {

        System.out.println("*****");

        System.out.println("Lab 6 Test Execution Start");

        System.out.println("*****\n");

        User superUser = AccessControlProvider.createUser("SuperAdmin", "SUPERUSER");

        User adminUser = AccessControlProvider.createUser("Admin1", "ADMIN");

        User managerUser = AccessControlProvider.createUser("Manager1", "MANAGER");

        User basicUser = AccessControlProvider.createUser("User1", "USER");

        System.out.println("\n--- Initial Users ---");

        System.out.println(superUser);

        System.out.println(adminUser);

        System.out.println(managerUser);

        System.out.println(basicUser);
```

```
System.out.println("-----\n");
```

```
System.out.println("--- Testing unique username constraint ---");
```

```
AccessControlProvider.createUser("Admin1", "USER");
```

```
System.out.println("-----\n");
```

```
System.out.println("--- Testing SUPERUSER view permission ---");
```

```
if (superUser != null) {  
    superUser.viewAllUsers();  
}
```

```
System.out.println("\n--- Testing non-SUPERUSER view permission ---");
```

```
if (adminUser != null) {  
    adminUser.viewAllUsers();  
}
```

```
System.out.println("\n*****");
```

```
System.out.println("Lab 6 Test Execution End");
```

```
System.out.println("*****");  
  
}  
  
}
```