

Learn of the Network Concepts Using Project Based Learning

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Abstract

The paper presents an application used by the students in the learning of networks communication and configuration functions. Based on the idea that only by interrogating and displaying of the network properties the student does not perceive the basics of networks and due to the fact that the number of possibilities in networks are large a skeleton project is proposed where the student contribute to a team implementation of a network resource management project and better understand basic principles of networking. Such that using project based learning aspects the student are further developing the skeleton project as a team.

Keywords: Computer Networks, Project based learning, network

1 Introduction

E-learning contains modern methods and technics based on information technology components like: multimedia, synchron and asynchron communication (Sangeorzan, 2003). All this components help user to obtain new knowledges in different domains.

Through the rapid access to the knowledges the educational software is an alternative to the classical learning methods. In a simple approach, the educational software divides in:

- Simple interactive presentations and tools which are making more efficient and attractive the teaching of the same knowledge that can be told in the classic mode too;
- Computer simulators which are reproducing a bounce of real process from all the domains, including those related to computer networks. These simulators offer the user the possibility to simulate critical processes and to better understand their business logic without producing any damage to the real system; in this class are also included certain themes about the administration of a computer network, when the students don't have the administration rights (Florea, 2003; Aldea, 2006).

In (Florea, 2003) is presented the simulation of some basic network administration operations, such the the installing of the network operating system, Microsoft Windows Xp, the IP adress alocation, the administration of account settings.

The XP firewall is a simple application which doesn't contain a tremendous menu with options for its own configuration. The user can only filter the ports, addresses and to establish the status for the log operations.

In the current paper a skeleton project is proposed where the student contribute to a team implementation of a network resource management project and better understand basic principles of networking.

It has to mention that the skeleton project is written in the programming language C#.

The project offers samples of some basic API's and the users must extend the functionalities. For example in the proposed version are implemented function for managing user and groups with a minimal number of parameters and the user should further extend the implementation to establish the properties for the new created user (for example it must set the login script). The user can also see the functionalities offered by the operating system itself by accessing the administrative tools components which are started directly from the menu of the program.

2 Network Resource Management Project (NRMan)

In this section is presented the project on which the students collaborate to learn network aspects. The students have to deal with knowledge's about devices, computers, and protocols, programming in networks and team working to solve network problems. So that the learners have to understand concepts and principles related to networks (Florea, 2004).

2.1 User requirements

It is required to implement/extend an application for network resource management. Using the application one has the following possibilities:

- list local services;
- start/stop local services;
- list open port for a workstation;
- read the networked station;
- list the remote processes;
- ping any station;
- manage local users and groups;
- manage network user and groups;
- resolve hosts (using DNS queries);
- see installed software;
- save the list with the installed software in xml files;
- compare lists with installed software;
- remotely install software;
- remotely upgrade software;
- trace route to other hosts – see the route for the packets from current station to a destination work station, etc.

While the project is a learning project the students have to specify other functionalities for the project and to collaborate to implement the new proposed requirements

2.2 Implementation

The project is implemented using C#. The user has to add new menu items with new functionalities or has to extend the existing functionalities. Some of the implemented functionalities are presented in the figure 1 and figure 2.

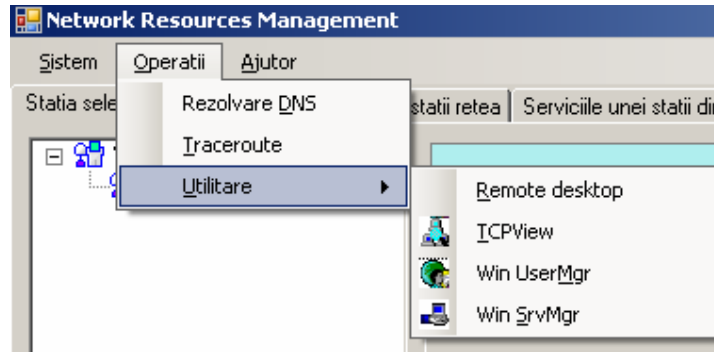


Figure 1. Application main menu

In the figure 1 it can see the application main menu. By using the main menu the user has access to the most of the implemented operations. Some important operations are those from the menu *Operatii* – using this operation the user start external processes and use external tools like: remote desktop connection, TCP Viewer, Windows user manager, Windows server manager, etc.

In the figure 2 are presented possible operations after selecting a workstation. As shown in the figure the user can do the following: see details about the work station, see running services, installed network interfaces, TCP connections, ping other station or the selected station, see the open ports, user account and groups, see the operating system version and see Win32 API functions parameters. While important functionalities are based on the Win32 API's the application offers a list with their parameter so that the user can consult them when it wants to add a new functionality to the project which is based on the API function call.

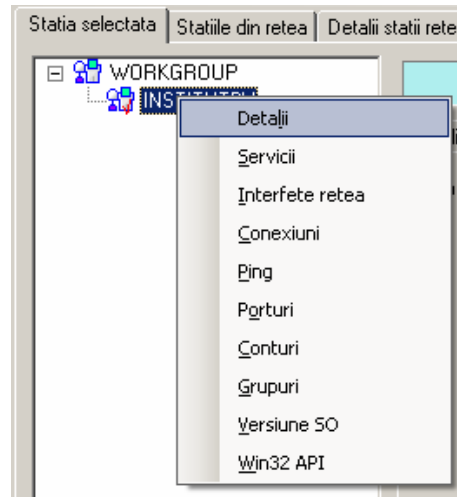


Figure 2. Workstation operations

2.3 Project structure

The project is organized using the methodology and the schema proposed by the Visual Studio IDE (figure 3).

One can see in the figure 3 that the user can easily add new function in the project and also extend the existing ones.

In the logic directory of the project is implemented the logic of the application. It contains the classes that are doing the network operation.

The view classes (the forms) are in the main directory of the projects.

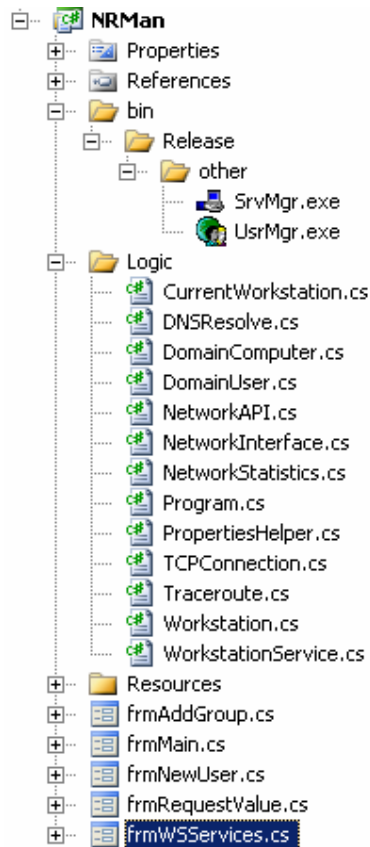


Figure 3. NRMan structure

```
// Separate Class to Hold the Network API functions
public class NetworkAPI
{
    // NetUserAdd - To Add Users to a local machine or Network
    [DllImport("Netapi32.dll")]
    public extern static int NetUserAdd([MarshalAs(UnmanagedType.LPWStr)] string servername,
```

Figure 4. Network API call

So that when a user implement a new functionality it adds the API calls and his implementation in a class in the directory login and then it adds also a view class to present graphically his implemented functionalities.

It can also add new resources to the project like images or external tools. The external tools are stored in the directory *other*.

While the project is collaborative the developer must respect some minimal editing rules which are already used in the other classes of the implemented solutions.

While in the .NET framework only some of the network API functions are defined in the namespaces, the user can use the network API calls like in the figure 4 to add different network functionalities.

To have the possibility to make the detection of vulnerabilities it has to save images with different lists (processes, connection, applications, etc). These lists can be saved in XML format or can be saved in database for further compares.

2.4 Application functioning

The user can run other tools or system tools to interrogate the workstation status and then can compare the results with the *NRMan* results. For example in the figure 5 are presented the local user accounts and some information about account, on the station *INSTITUTBV*, obtained using the *NRMan* functionalities.

Name	Domain	Disabled	FullName	Status
Administrator	INSTITUTBV	<input type="checkbox"/>		OK
ASPNET	INSTITUTBV	<input type="checkbox"/>	ASP.NET Machine Account	OK
Guest	INSTITUTBV	<input checked="" type="checkbox"/>		De
HelpAssistant	INSTITUTBV	<input checked="" type="checkbox"/>	Remote Desktop Help Assistant Account	De
Institut	INSTITUTBV	<input type="checkbox"/>	Peacemaker	OK
IUSR_INSTITUTBV	INSTITUTBV	<input type="checkbox"/>	Internet Guest Account	OK
IWAM_INSTITUTBV	INSTITUTBV	<input type="checkbox"/>	Launch IIS Process Account	OK
SUPPORT_388945a0	INSTITUTBV	<input checked="" type="checkbox"/>	CN=Microsoft Corporation,L=Redmond,S=Washington,C=US	De

Figure 5. NRMan Workstation user accounts

The common implementation and work to the project build the community of students around the network principles and issues. Team work allows the integration into the project of different point of view and modes of understating of concept. Any user has access to the information put by the other student. Also the students can concurrently work in developing of bigger functionalities.

3 Project based learning

A project based learning method is a comprehensive approach to instruction. The students participate in projects and practice an array of skills from basic concepts, protocols, programming primitives and devices.

The collaborative nature of the investigation enhances the student's implication.

The Project Based Learning techniques imply in this situation that a skeleton project for administering the network was created. The skeleton covers a bounce of operations,

administration issues, commands, etc. The user which has basic knowledge's cannot conceive such a project with all the interrelations between the task and operations. So that the project permits to the student to acquire knowledge's about the whole administrated network not only one specific operation.

The students collaborate to solve the tasks. The interaction with other people which have other type of knowledge's give the student to possibility to express itself and to discuss and better understand the studied aspects.

One of the main teacher concerns is to equilibrate the assignments and to make clear and general accepted difference between given and proposed functionalities of the implemented application (*NRMan*) so that the grade system keeps his characteristics.

4 Conclusion

Using the project based learning principles the teacher is able to incorporate numerous teaching and learning strategies into project planning and implementation. By offering the students the possibility to develop their own assignment and to write their own tasks, they are deeply implied in the learning process. The students are part of the teaching process and they don't feel that the tasks are external task while they are included into the process.

Between other advantages is also the fact that the written code is reviewed by other coders implied directly in the project so that the students functionalities must have a high quality level to satisfy all the implied members into the project.

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