Tools for Multi-platform Network Management

Felipe Nunez, Professor
Pontificia Universidad Madre y Maestra (PUCMM), Santiago, Dominican Republic
ranunez@pucmmsti.edu.do

Abstract:

Theoretical foundations for software management in digital networks lag behind real life network development. Closing this gap has been a crucial concern in network undergraduate education. Furthermore, most production centers and private institutions use commercial software, while open software is, per se, very attractive for inquisitive academic minds. To create, maintain and manage an educational lab using servers and workstations with at least two operating platforms and technologies cemented by Open Software can be a challenge for undergraduate education. This paper presents a global approach to network management using the most important tools from the Open Software world at our disposal. First, it will be shown that simple computer facilities can be transformed in complex world network laboratory. Second, students can begin to play real life activities designing network of their choosing. And third, students get confronted with simulated real life problems.

Keywords :

Network management, network security, linux, samba

1. Introduction

It is a known fact that computer systems have being continually undergoing a revolution since the beginning of modern computer era since, at least 1945. More so, since the middle of the 1980 decade cheap and powerful computers became an every day appliance. Personal computers irrupted at a cheap price and with processing power superior to the, till then, unchallenged mainframes. With the advent of high speed Local Area Networks (LAN) the use of modern information systems penetrated almost every type of organization which had some roll in society. Up to then, Colleges and higher education center in not so well developed countries could cope with challlenges in education in information systems recurring to, and totally depending on, the only and existing technologies at the moment: use of the so called mainframes and their operating systems. Internet, as we know, has, in the last fifteen or so years, open a new world not only in the business mainstream but has posed new challenges in the research field as well.

IBM was for the most part of the last century a dominating power in the information and computer area. This company with the dominating position has already established solid and permanent relations with the academic world. A graduate student from that time, with sufficient knowledge in the existing and dominating technologies, could confront reality with the intellectual baggage he obtained at the campus.

But all changed almost suddenly.

2. Overview

Personal computers could communicate one with another. UNIX the open source operating systems and creator of the back-bone of the emerging internet disappeared from the academic world.

It is true that Vrije University Professor A Tanenbaum distributed a light version of UNIX called Minix that tries to replace UNIX. But the importance of network theory that emerged with UNIX did not diminish a bit. On the contrary.

Universities could cope with the new challenges updating their curriculae so that business, civil engineering, architect and medicine students, for example, could learn new tools, especially, software one, and through internet could update their knowledge. But, how did computer science students confront the new times, especially in the network management field? Not only theory in computer network has being left behind, but in the academic world there is no definite way to solve this problem as well.

We propose to confront undergraduate students with reality constructing, with standard and normal workstations, a new network entirely designed by the students and using the best of two worlds: linux and Windows. But, as learning to manage requires working with personnel which will be controlled in what and how to use available resources, we propose that students group themselves and work with different networks in the same lab.

3. Approach

Let us assume that for economic, or other reasons, we begin with, for example some twenty five or so windows computers or workstations in a very protected networked environment. To begin with, it's possible to install in all or some of them another operating system, in our example linux. Having dual-booting you have, in no way changed the initial settings. But there exists the possibility of letting senior college students take the roll of administrators in the new created environment.

Having the new operating system tcp-ip as native network protocol, you can choose to establish at three or more sub-networks using the available private ip addresses. We prefer to have in each sub-network a range from the established class A, B and C, that is, network addresses 10.x.x.x, 172.[16-31].x.x and 192.168.[0-255].x and with them construct classless networks. Choosing network addresses, network masks and range of machine addresses to use should be no problem for students with sufficient network theory knowledge.

Having designed the networks the next step is getting is getting them to communicate one with another. To that end it ist not necessary to get any additional network cards as linux allows to establish gateways between the sub-networks linking the existing cards to new ip-addresses.

Suppose you already have established and let students administer those lab designed networks. What about the real world dominated by Windows networks?

Reverse engineering.

One of the most challenging and controversial area of software engineering is reverse engineering: you get a black-box and you try to reproduce it without knowing anything about what is inside of it.

In 1991 Andrew Tridgell “without knowing the significance of what he was doing, Andrew created a file-server program for an odd protocol that was part of Pathwork”. In that way a product, called Samba was born.

As stated on Samba: “the goal behind the project is one of removing barriers to interoperability”. So using this tool could allow production centers or academic classrooms to get the best out of windows and other operating systems. In other words, through reverse engineering we can take advantage and discuss how a commercial network protocol and operating system does its job.

4. Considerations

The moment two different network protocols get to work together a lot a new considerations come to view :

a.- Security
b.- Limitations
c.- Time synchronization
d.- Authentication

Each one of those items implies getting hold of new tools.

Security and time synchronization get in hand with new services like creating fire-walls with ip tables or network time protocol daemon(ntpd).

But as the official samba howto specifies, the tasks samba can do are:

- Share one or more directory trees.
- Share one or more Distributed filesystem (Dfs) trees.
- Share printers installed on the server among Windows clients on the network
- Assist clients with network browsing.
- Authenticate clients logging onto a Windows domain.
- Provide or assist with Windows Internet Name Service (WINS) name-server resolution.

In other words from both platforms have we a large menu to make diverse combinations.

- Configure a linux box to provide remote access to local files and printers from Microsoft Windows clients.
- Utilize samba client tools to access files on Windows servers.
- Configure the linux box to act as simple stand alone server.
- Configure Samba as a member of a Windows Domain in order get authentication from the Windows PDC.

5. Conclusions

Going from simple to complex tasks we should:

- Construct several networks using private ip-addresses.
- Link the different networks though gateways in linux boxes.
- Install one or more samba server configuration.
- Select one or more authentication methods using new types of server to that end.
- Do the tasks network administrators have as a day to day work: security, synchronization.

All of which will require use of normal tools for such jobs.

To train any person in administrative duties is contradictory in terms. To obtain such goal requires training others to be led, or training students to work in teams in which each participant must learn to play different rolls. Those considerations must be accounted for when there is talk about network management.

Personal experience has shown that such approach leads to continually stay up to date in the problems we

simulate in the lab. So, instead of problems we get new challenges.

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