

## NICHO: FACILITATING A COLLABORATIVE NETWORK OF SCHOOLS

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**Abstract.** Theorists and practitioners propose collaborative learning as a recommended methodology within constructivist environments. Concept mapping in particular has been shown to be an effective tool to support collaboration among students. However, seldom are teachers and students provided with the appropriate communication and collaboration tools, many of which are commonplace in corporations and large organizations. In this paper we present *Nicho*, a set of software tools that facilitate the creation of a collaborative network of schools, enabling students and teachers to take advantage of communication and collaboration tools. *Nicho* provides students and teachers within an organization of schools with email, chat, CmapTools integration, and their own personal “space” for file storage, accessible from any computer in the school or remotely.

### 1 Introduction

Professionals in corporations and organizations in general are used to a certain set of computer functions without which it would be almost impossible for the organization to operate effectively. They are used to having their own unique personal identification within the organization’s computer system (e.g. a “userid”) that is used to locate colleagues within the organization through a global directory, and functions to communicate and collaborate with these colleagues through electronic mail (email), instant messaging, and more recently social networking environments and technologies like wikis, blogs, etc. Additionally, on a “personal” desktop computer, a laptop, or through a shared server, professionals have their own “space” in which they can store files, whether these are documents, spreadsheets, presentations, emails, etc. In organizations that have offices in multiple locations, which could be within the same city, region, country or international, this functionality is expected to be available organization-wide, transcending any physical distances.

Schools, for the most part, do not offer these functions to their professionals: teachers and school administrators. In many countries, public school teachers are not even provided with an email address, let alone facilities to collaborate with colleagues or a personal “space” to store files. It is not uncommon for teachers to share *hotmail* or *yahoo* emails with other teachers with whom they want to stay in touch. Providing this kind of functionality to students is seldom even considered -- usually providing “Internet access” is assumed to be sufficient. For the most part, the technology acquired in schools is purchased through a technology-centered decision making process that gives careful consideration to the “educational software” that needs to be installed on every machine, and gives very little thought to the needs of its main users, namely the teachers and their students. In organizations that include many schools, e.g. the Ministry of Education of a country, province, or state, the hardware and software configuration is determined for one school (usually a lab configuration), and multiplied by the number of schools to determine the total purchase of hardware and software.

The difference between the functions available to professionals in corporations and to teachers and students in schools is abysmal, even though the end-computer, whether desktop or laptop, is usually very similar in capacity. In public schools in most countries, seldom can a student work on a document, save it onto his/her personal space, and afterwards continue working on it from another computer within the school or from home; seldom can a teacher communicate electronically with other teachers, and even less frequently are students able to communicate electronically with students in other schools. Each school is configured as an island, with little or no communication with other schools in its parent organization, whether this is at the level of a school district, a state/province, or a country. The school system for these organizations as a whole is not designed, organized or implemented in a way that users, whether teacher or student, have the functionality available to allow them to effectively communicate and collaborate with other users in the organization.

Educational theories, supported by practitioners’ studies, encourage collaborative learning among students (Scardamalia & Bereiter, 1993; Vygotsky, 1978). The best educational use we can make of the Internet is to facilitate the collaboration during knowledge construction among students, as opposed to consuming information by “cutting” and “pasting” from Web pages onto reports. However, the functionality available in schools seldom facilitates this collaboration. Concept maps have been shown to be a powerful tool for collaboration and sharing, and software programs like CmapTools (Cañas et al., 2004) support the collaborative construction and sharing of concept map based knowledge models. It is therefore critical that we provide schools with the powerful functionality that modern technology is capable of delivering.

In this paper we present *Nicho*, a software environment that provides teachers and students in a school, or group of schools, with their own unique userid, an email address, chat, and a personal space for storing documents; and this same environment configures CmapTools and a CmapServer for storage of knowledge models. In *Nicho*, students and teachers are able to access their “space” and their communication tools from any computer in the school, and from outside the school, e.g. the home or an Internet café. *Nicho* was designed for the Conéctate al Conocimiento (Tarté, 2006) project in Panamá, and is being deployed and used to provide a collaborative environment to public schools throughout the whole country.

## 2 A Collaborative Network of Schools

The Conéctate project was designed to be a collaborative network of schools, reaching elementary public schools throughout the entire country of Panama. At the time of this writing, nearly 700 schools have been incorporated, many in extremely rural areas. Classroom teachers participate in a two-week full-time workshop that emphasizes concept mapping, meaningful learning, and collaborative projects, based on a concept map-centric model (Novak & Cañas, 2004). Each of the schools has an Internet connection with a public IP address that allows a computer server -- which includes a CmapServer (Cañas, Hill, Granados, Pérez, & Pérez, 2003) that is installed in every school -- to be accessed from anywhere on Internet. Within the school, computers are installed in a computer lab or, more recently, laptops are provided that students can take to their classrooms. At each school, a local area network with a public connection to the Internet contains a server computer using Linux as the operating system running a CmapServer among other server programs. Clients are currently desktop and laptop computers running Windows XP. The network was conceived to provide teachers and students with an environment where they can collaborate and share in their knowledge construction using concept mapping and other tools.

## 3 Nicho

*Nicho* is an integrated set of software tools that facilitates the creation and management of a collaborative network environment for a group of schools. In general, it enables (a) the creation of unique userids for teachers and students, (b) the creation of a global directory and local directories of teachers and students, (c) the creation of email accounts based on the userids, (d) the creation of a “remote desktop” which provides users with a “space” to store documents accessible from any computer in the school, (e) a chat environment, (f) integration of a CmapServer, (g) remote accessibility to resources, (h) pre-configuration of applications such as email and chat clients, Web browser, and CmapTools.

### 3.1 The Nicho Architecture

*Nicho* provides the “glue” which brings together a collection of open-source and free-software components, with a single installer for easy setup, and a user-friendly, web-based interface for configuration and administration, as shown in Figure 1. In addition to a Linux server in each school, a group of global servers provide services to all schools. Among these, a Master LDAP directory<sup>1</sup> is used to manage a global directory of users for the organization (in the case of Conéctate, all public schools). A Jabber chat server<sup>2</sup>, authenticated through the Master LDAP directory, provides chat functionality to all users. Email accounts are created through Google Mail<sup>3</sup>, with a customized domain for the organization (e.g. “conectate.edu.pa”). At each school, a local LDAP directory<sup>1</sup> synchronizes its list of users with the Master directory, and stores additional information required for local administration of that school’s users. The Samba<sup>4</sup> software on each school’s server provides file storage and a “remote desktop” environment for each user, allowing the user to login from any Windows client computer in the school. A CmapServer is configured to authenticate users with the local LDAP directory. Finally, a Web server<sup>5</sup> provides Web-based configuration and administration of user accounts, as well as secure remote access to a user’s files in his/her “space” (remote desktop).

### 3.2 Creation of userids

In Conéctate it was not possible to rely on official lists of students to create userids in batch. Additionally, since not all schools are initially connected to the Internet, the creation of unique userids needed to consider the case of schools where userids are created but need to be confirmed later, when the school becomes connected to the

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<sup>1</sup> OpenLDAP, <http://www.openldap.org>

<sup>2</sup> OpenFire, <http://www.igniterealtime.org/projects/openfire/index.jsp>

<sup>3</sup> Google Apps Education Edition, <http://www.google.com/a/help/intl/en/edu/index.html>

<sup>4</sup> Samba, <http://www.samba.org>

<sup>5</sup> Apache Tomcat, <http://tomcat.apache.org>

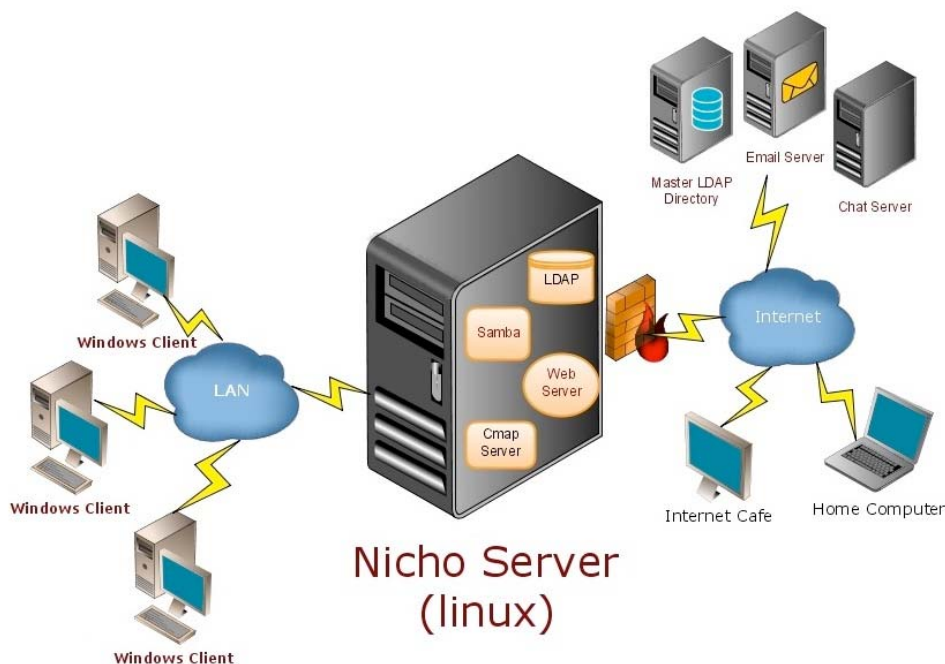


Figure 1. Nicho is a glue that brings together several components to provide a collaborative network environment to a group of schools.

Internet. Through the simple interface shown in Figure 2, *Nicho* relies on the personal information provided by the teacher and student him/herself (full name, birthday and age, grade, password, etc.). With this information, *Nicho* creates a userid that is unique within the organization by validating it with the Master LDAP directory (in the case of Conéctate, unique among all students and teachers in the country). If the school does not yet have an Internet connection, *Nicho* remembers that the userids need to be confirmed with the Master LDAP directory when the connection is established, in which case some students may be notified that their userids have changed. However, given the algorithm used to create the userid, based on full name and date of birth, the chance of this happening is quite low.

### 3.3 Profiles and other functions

Once *Nicho* has created a userid, it proceeds to create a personalized environment for the user. This consists of (a) an email account according to a preconfigured Google Mail domain (this step is taken at a later stage if the school does not yet have an Internet connection), (b) the setup necessary for accessing their "space" (remote desktop) in the Samba server upon login to the environment, (c) through KEA (Cañas et al., 2006), folders on the CmapServer with the appropriate permissions (each student has a folder in the CmapServer, and a shortcut to it from his class's folder; all users in Conéctate are given "annotate" permission on other users' folders), and a shortcut under the student's "My Cmaps" so he/she can easily access the folder on the CmapServer, (d) configuration of the CmapTools client, email client (Thunderbird), chat client (Spark) and Web browser (Firefox) with the student's or teacher's information (name, userid, password, etc.).

### 3.4 Nicho usage

*Nicho* sets up the user's environment during the account creation process, and the configuration can be modified through Web-based administration screens, but *Nicho* is not a program that "runs" on the user's computer. When the user, whether the teacher or student, logs in to the client computer by providing their userid and password, the environment is set so that the corresponding personal "desktop" is loaded from the school's server. The user has a personal drive available in which to store all of his/her files (including the standard Windows XP folders: My Documents, Desktop, etc., as well as the My Cmaps folder from CmapTools). This drive is mapped to the user's private storage space on the server. From the first time the user logs in, email and chat are available to start communicating with other students and teachers. Through the chat client or through *Nicho* Web pages, users can easily locate other users throughout the organization. The student's "space" is available from any computer in the school, whether it is at a computer lab, in the classroom, in the library, or on a laptop. From remote sites (e.g. at home or an Internet café), users can access their "space" via a Web browser, allowing them to download files, work on them, and upload them again to their space.

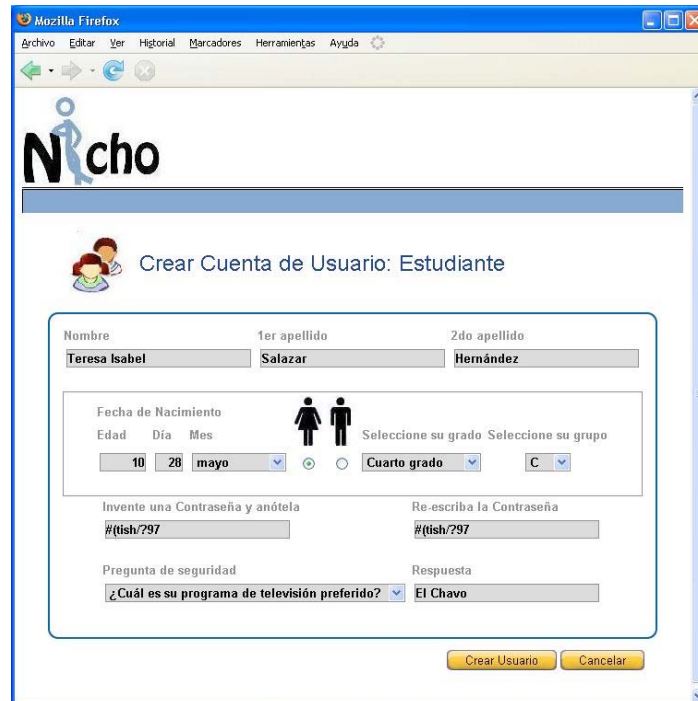


Figure 2. Through a simple screen the student provides the information necessary to create a user id.

#### 4 Summary

Through a simple set of Web-based user interface screens, *Nicho* enables students and teachers to create their own user account with a personal “space” in the local school’s server, an email account, and a remote desktop with pre-configured application profiles for chat, email, CmapTools, and other programs. Within the Conéctate al Conocimiento project, *Nicho* has provided the means to implement a collaborative network of schools, providing students and teachers in the project with collaboration and communication functionalities normally found only in corporations.

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