

# Social-Technical Implications Establishing a Mesh Network within an Inter-Cultural Neighborhood

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## ABSTRACT

This text is describing the establishment of a mesh network of the inter-cultural computer clubs “come\_IN”. This idea of a mesh network that covers the whole neighborhood of a city results from experience within the project “come\_IN” in Germany. In this workshop we want to highlight the connection between social and technical intervention in practice. For discussion in the workshop we introduce our first detailed findings on development and usage of the mesh network.

## Categories and Subject Descriptors

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## General Terms

Design, Human Factors.

## Keywords

Mesh network, neighborhood, inter-cultural, computer-club.

## 1. INTRODUCTION

The inter-cultural computer clubs “come\_IN” are part of a research project at the University of Siegen in Germany. “come\_IN” are computer clubs in primary schools in which parents and children participate voluntarily. Members of different migration backgrounds meet once per week to work on projects, study or play games. The mutual practice of 6-12 year olds and their parents leads to changes: Members develop new social contacts in their neighborhood, the perception and understanding of their own role and identity changes – alterations which are extremely important for the process of integration.

In this context a new mesh network that is located in the neighborhood of one of the computer clubs will be established to support the “come\_IN” project. This position paper describes idea, concept and construction of this mesh network. The first chapter presents the “come\_IN” project, introducing the two already existing clubs and their development, and informing on work methods. The following part explains preliminaries and planning of the mesh network as well as concept and development of the two clubs from a social and a technical point of view. Motivation, reasons and aims that were pursued when constructing the

mesh network are described before the first concrete steps and an outlook are given.

## 2. THE INTER-CULTURAL COMPUTER-CLUBS COME\_IN

The first “come\_IN” club was opened in a primary school in Bonn (Germany) in March 2004. The school is situated in a multi-ethnic neighborhood: almost 30% of the inhabitants are immigrants, especially from Turkey. This is mirrored in the primary school as well as in the computer club, where nearly 50% of the members are of Turkish descent. Publications on development and results of the first club already exist. [6,7,8]

Members meet once per week in the afternoon for two hours. Usually, a child has to be accompanied by at least one parent. The participants decide together on joined activities and projects. These projects are often related to the neighborhood; small magazines, video films or Scratch projects [4,9] are created quite often. Schoolteachers, former students and research assistants of the university support the project.

A second club was opened in a primary school in Siegen (Germany) in August 2006 to test the transferability of the “come\_IN” concept. The findings of the first club in Bonn were taken into account in order to improve the social and technical construction of the new club. Participants have more possibilities to plan projects, which implied more responsibility for the club, its participants and projects. The following section provides a detailed description of the technical installation and adaptation.

The accompanying research project of the University of Siegen concentrates on action research. Several research assistants participate in the clubs and work with methods of qualitative social research in addition to their active or observing participation. The most important tools are conducting narrative interviews, group discussions and the creation and evaluation of audio and video recordings.

## 3. PRELIMINARIES AND PLANNING OF THE MESH NETWORK

An increased mobility and flexibility of the used hard- and software was very important right from the start of the second club. Due to the very limited spatial possibilities at the beginning, the club had to be as independent of a particular room in the school as possible. Even after the clubroom had been finished, this independence was advantageous. Laptops are used frequently –

the club owns only three stationary computers that are more efficient and are therefore used for relatively complicated and time consuming activities, e.g. the production of videos. The computers are connected via a normal local area network, a fast wireless local area network (WLAN) is used for the wireless connection of the laptops. A server provides several basic services, an internet connection and the participants' user accounts (see Figure 1). Accounts and data of the participants are not only stored centrally, they are also mobile. Thus members are independent of the local school network, and can work from outside the school as well. When they get back to the club, the data is synchronized automatically.

The first club in Bonn has a shared folder on a server without any specifications of rights for mutual projects and the exchange of data. After a while, this has led to disorder of the stored data – the participants had to search for their data very often and it was occasionally even impossible to find it. The introduction of personal accounts in the second club in Siegen disposes of or at least reduces these problems. Personal accounts allow individual workspaces, which is especially attractive for the children. The possibility to change a previously fixed wallpaper made the extra effort of remembering a personal password acceptable.

In addition to the computers mobile devices like digital cameras are used for taking pictures and making recordings that are processed further in the club. By now, participants can use all the offered services and possibilities in the school and the surrounding area. Not only the laptops are connected, also first attempts have been made to transfer pictures wirelessly as well.

In order to further develop structures of technical mobility and independency in the club, a mesh network that is located in the surrounding neighborhood is being established at the moment. [3]

Mesh networks are organized in a decentralized way, and are therefore different from normal networks. Every participant is represented by a network node and contributes to the creation of a mesh network, in which everybody takes part in the exchange of data. When a network node disappears, the other members can work without being disturbed noticeably, due to the automatic reorganization of the network and the routing of data via alternative ways. [1,2,5]

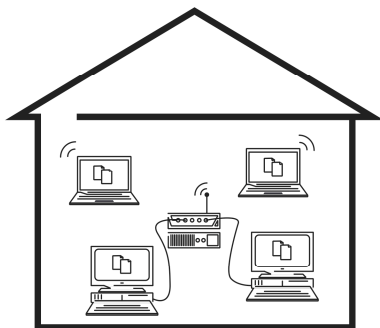
With the active help of the club's participants this mesh network may connect the participants as well as the two clubs in Siegen and Bonn. It is planned to install mesh routers as first nodes of the network in the participants' houses and apartments. Club members will be familiarized with the devices and thus will be

able take care of their maintenance by themselves after a while. To optimize the reliability and coverage of the mesh network, the installation of additional network nodes on roofs, poles or other suitable places is being considered at the moment. It is meant to provide possibilities for direct and indirect communication as well as the exchange of project data. The use of a wireless mesh network may be seen as a technical realization of the club's social structure. Starting in the school, the network is meant to “grow into” the neighborhood and shall provide interested persons with the opportunity to gather information about the club and maybe even participate in it (see Figure 2). The most important reasons for a “neighborhood-based network” are:

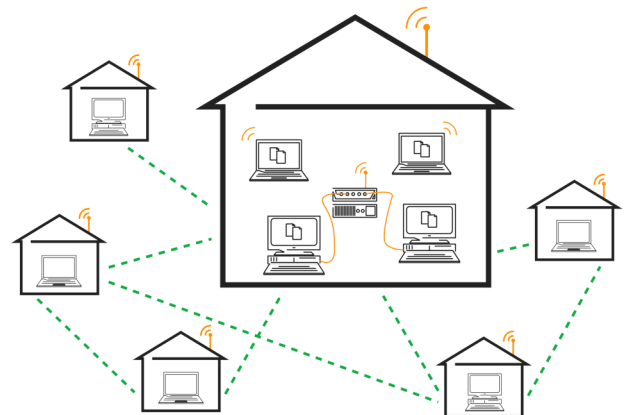
- closer connection between participants and clubs due to direct communication and easier data transfer
- longer or more frequent meetings to make activities outside of normal opening hours possible (a frequently uttered demand of participants)
- better support of activities outside the club's rooms (e.g. by the use of location-based services)
- the possibility to use the network as a contact and information platform
- active and direct participation of the members while constructing the network
- “self-organization” of a wireless mesh network can be used for its own growth and development; it offers a high availability and stability and is relatively cheap with regard to acquisition and maintenance and is independent of commercial providers
- the possibility of a cheap or even free broadband internet connection, which could be another important reason for the participation in the club, and could support the overcoming of the digital divide (more than 50% of the participants do not yet have a broadband internet connection at home)

The development of a mesh network can support interaction and communication processes on several levels:

- in the club when the participants are working on individual projects
- in the neighborhood for communication and sharing data



**Figure 1. The come\_IN network at the beginning: a normal LAN and WLAN inside the school**



**Figure 2. The future come\_IN network: a mesh network within the inter-cultural neighborhood**

- between different clubs and neighborhoods
- communication with the “outer world” for interested persons who might want to join
- it can support the creation of new clubs (in combination with a community platform for self-organized development)

The creation of a community platform was initiated to foster the communication between the clubs as well as to support new ones. This happens in close connection to the mesh network, but cannot be elaborated here.

The first steps for the creation of a mesh network have already been taken, because a WLAN is available in club, school and surroundings in Siegen. The school itself has the possibility to cover great surrounding areas and long radio links in the neighborhood due to its location and size. The participants are interested and willing to contribute to the network, and their ideas will be collected in workshops, where the technical possibilities will be discussed as well.

#### 4. OUTLOOK AND CONCLUSION

We mentioned important steps that have to be taken next in order to establish a mesh network. By the time of this workshop these steps will already have been put into practice. The experiences and detailed findings that may be concluded from the usage of the mesh network may give rise to discussions with the workshop participants.

#### 5. ACKNOWLEDGMENTS

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