

## Information Protection in Video Relay Services

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### Abstract

This work in progress paper reports on initial research into the protection of information of the individuals that make use of video relay services. Our research team has developed an application called SignSupport, to aid in the communication between a text illiterate Deaf person and a non-signing pharmacist. After a Deaf person hands SignSupport to the pharmacist, s/he can view the prescription in South African Sign Language. SignSupport keeps personal and medical information on the phone that needs to be protected. This project focuses on the provision and security of voice and video over Internet Protocol transmission for video/voice relay integrated into SignSupport. Areas of research include: authentication methods, sign language video encryption techniques, and secure and protected data transit for an IP-based relay system. We also intend to implement and evaluate these security measures within the context of the South African Protection of Private Information Bill. Action research methodology will apply to this project, with consultation from inter-disciplinary groups such as the Deaf Community of Cape Town, legal experts, network and information security experts as well as application developers, for input and direction of this research.

### Categories and Subject Descriptors

C.2.0 **[General]:** Security and protection; K.4.1 **[Public Policy Issues]:** Privacy and Regulation; K.4.2 **[Social Issues]:** Assistive technologies for persons with disabilities

### 1. Introduction

Protecting private information of people is under the spotlight in South Africa (SA), backed up by SA government's new Bill currently going through parliamentary structures for approval; namely the Protection Of Personal Information Bill (POPI) [3]. Section 14 of the South African Constitution guarantees every South African a right to Privacy. The POPI Bill will intensify this constitutional right, and is based on principles to enforce information protection.

This research aims to investigate what impact POPI will have on current and existent Information and Communication for Development (ICT4D) projects. Glaser and Tucker [2] focused their research on bridging the digital divide between the Deaf and hearing enabled in South Africa. Their research led to the development of applications that allow Deaf people to communicate with hearing people using mobile phones. One aspect of their research was a semi-synchronous technology called Video Relay Service (VRS) that allows a Deaf person to communicate with a hearing person

using a sign language interpreter to relay messages between the two individuals. The communication in VRS is done using two computers with cameras attached over high speed Internet. The Deaf person will communicate in sign language with the interpreter over computer and camera, in turn the interpreter will communicate in voice to the hearing person; and the process is reversed for communication from the hearing person. Recent advancements allow the human sign language interpreter to be replaced by a software application as in the research done by Chininthorn *et al.* [1], who designed a Deaf communication aid to assist with communication between a Deaf person and a pharmacist.

Mothlabi *et al.* [7] developed an asynchronous stand alone application, called SignSupport, a variant of mobile VRS based on the design developed by [1]. SignSupport with the assistance of pre-loaded SASL videos locally stored on the mobile phone memory allows a Deaf person combined with a paper prescription provided by a medical doctor, to collect medication instructions from the pharmacist. The Deaf user is asked to enter pertinent biographical and background information into SignSupport to assist the pharmacist when dispensing medication. The Deaf person answers a set of predefined questions, delivered in the form of the SASL videos, and interactively answers the questions by means of the mobile phone's touch screen. The pharmacist then interacts with SignSupport when dispensing by taking a picture of the medication to be dispensed, as well as selecting the dispensing conditions from the mobile phone's touch screen. Since SignSupport stores a limited number of communication possibilities, mostly from pharmacist to Deaf patient, there could arise the need for full-fledged VRS, on the mobile device, to enable free-form communication between them.

This project focuses on the provision and security of IP transmission for video relay integrated into SignSupport to provide for the following: (1) the need for a breakout to an interpreter to assist with communication breakdown and (2) to implement and evaluate security measures within the context of POPI.

Methods of protecting information include means of user authentication, localized data protection by means of encryption, as well as data protection in transit (over communication link). The use of digital signatures and certificates will be investigated to authenticate the sender and the receiver of encrypted data suggested by Hooda and Singh [5]. Securing the video data in transmission can be done in various ways. This research study investigates the use of conventional encryption techniques [6], such as complete encryption, partial encryption and perceptual encryption, all of which can be used as part of the video encoding process. However, only the latter would be feasible for SignSupport due to the limited processing power of mobile devices. Wang and Ho [8] propose using an application layer security scheme for video transmission by transposing the video blocks in the buffer of the sender with a secret key before sending it on the public network. Some companies, such as Sorenson, have developed VRS that consists of a video phone attached to a monitor,

and connects to a Sign Language interpreter over high speeds when a Deaf person wants to communicate with a hearing person. The interpreter is situated in the middle of the communication link relaying voice to sign and sign to voice. IWRelay is an iPhone application developed by Healinc Telecom, and allows a VRS call to be made from an iPhone connecting to the SL interpreter for communication relay. Other mobile applications with similar functionality for Android are nTouch, PurpleVRS, and Sorenson Video Center, a mobile version of the videophone implementation.

## **2. Methods**

Action research (AR) [4] will be applied to this research aligned to the social and technical aspects identified. The motivation for applying AR is based on cyclic consultations and feedback sessions with stakeholders in different niche areas. This research will iteratively involve planning the scope and parameters of the project, acting on the plan with the identification and evaluation of existing security implementations for voice and video over IP. How can the private information of Deaf people be protected when using SignSupport? How can we protect video when SignSupport breaks out to a relay service? Will Deaf users be aware of POPI and why there is a risk of their information being compromised? One aim is to implement the most suitable security mechanism for video over IP for mobile phones with limited resources. Another aim is to educate Deaf people on personal information security and the protection offered to all through POPI legislation. We shall conduct information sessions with Deaf people for educational and data collection purposes. Experimental application design and implementation will occur via collaboration with a multi-disciplinary team in the security, legal and software engineering fields. We will observe results of experimental application design based on penetration and vulnerability testing. We will analyze data collected to establish a baseline for the first cycle of research and as input to subsequent cycles. Finally, we will reflect on whether the objectives have been obtained or not, and what to focus on in the next research cycle.

## **3. Future work**

The aims and objectives of this research are to improve current VRS technologies by implementing security measures that will provide compliance with POPI. Penetration testing of SignSupport will allow us to identify the insecure functional areas that need to be secured. Data compression and encryption techniques obtained via consultation with security specialists and a literature review will be used in a laboratory environment for protecting data on device and in transmission when investigating VRS solution for Sign- Support. As part of the awareness campaign of POPI to the Deaf, demonstrations showing how data can be compromised using unsecured SignSupport and VRS as opposed to the secured versions. An application development deliverable from this research will aid other ICT4D projects such as health, banking or other e-business development to implement security controls to secure private information as prescribed by POPI.

#### 4. Acknowledgements

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