Sanday – Your health guide

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Abstract: It is difficult to find a doctor's surgery or a pharmacy, particularly when you are traveling somewhere in Switzerland. For this reason, the Swiss insurance company Suva, in cooperation with a wide range of partners, has developed Sanday (Santé every day), an information system for use with a mobile telephone and via the Internet. Sanday combines a GIS (a geographical information system), a localized service for the mobile telephone (LBS – a location-based service), an interactive telephone service (IVR – interactive voice response), addresses as well as further information provided by the health service. When it is used via a mobile telephone, the user is automatically localized and the address of one of the nearest medical service providers is transmitted via SMS. When using the Internet, the address of the location is first entered at the URL `www.sanday.ch` which then displays the appropriate sectional map. This is followed by the display of healthcare addresses in the area. The information is provided by associations and institutions in the Swiss health service.

1   Initial situation

Suva decided that its strategy would be to provide better support for small and medium-sized companies and to offer Internet services. The idea of a geographical information system that linked geography and the addresses of medical service providers was born and immediately implemented under `www.sanday.ch`.

In Switzerland, Suva insures companies in the secondary sector against accidents, that also includes the construction industry and forestry operations. When a new worksite is to be set up in a forest or a new construction site, these companies have to produce a safety plan that sets out the measures to be taken if an accident should occur. This plan includes the address and telephone number of the nearest doctor as well as a description of the way to the nearest hospital. Sanday helps companies to compile the information required by providing the addresses of the nearest healthcare providers together with the sectional maps and routes required.

Regular travelers know only too well how difficult it can be to find a pharmacy or a doctor's surgery when they are abroad. A mishap with a tooth or the sudden illness of a family pet that has been taken along on holiday can be worrying and maximum priority is given to finding medical services. Although Switzerland has a high density of healthcare providers,

this generally fails to be the case when help is needed. This is where Sanday comes in.

2   Concept and creation

On the Internet, there is a wealth of geographical information systems with which the addresses of a wide range of business branches have been visualized. The addresses usually have their origins in the databases of professional address brokers and are displayed on map material (vector maps) with limited functions. Sanday is based on long-term cooperation with associations and institutions in the Swiss health service and on top-quality maps. For this reason, high-grade map records are used to depict the addresses. For example, the whole of Switzerland is available in satellite views, details on aerial photographs, on ordnance survey maps and, wherever available, on city street maps. The target is for Sanday to be a platform for geographically oriented applications in the health service. That is why a new design that is as neutral as possible has been chosen instead of Suva's corporate design. The name "Sanday" was the result of a brainstorming session and was chosen both for its brevity and its reflection of the languages spoken in Switzerland. The meaning of "Santé every day" came out later after the new service had usually been mistaken for "Sunday". From the very beginning, it was clear to the project group that not enough resources would be available for the creation of a new brand and therefore the name "Sanday" was not a priority for acquisition.

In discussions with Swisscom Mobile, which has 3.5 million mobile telephone customers in Switzerland, the idea of mobile and localized access to the addresses and telephone numbers of local medical service providers developed at the same time. In the year 2000, everything appeared to be feasible and there were only a few voices that warned against it. As a result, the entire project submission was approved and implemented in stages. The fact that technology and content did not always meet our quality standards bothered us less at that time since we wished to provide proof of the concept and then improve its quality gradually. The location-based service was implemented after a delay of one year since, in the meantime, reality had overtaken the fantasies propagated by the Internet and the stock exchange and companies had become more reticent regarding promised solutions. Because Suva repeatedly underscored its intention and the concept met with major interest, the service was finally presented to the public in November 2001. Initially, the media showed little interest in this innovation. People's weariness with technology was only too obvious following the Internet hype of the past. It was no different in discussions with insurance companies that had been asked to present their agencies or their contractual doctors registered in HMOs on `www.sanday.ch`. It would appear that much more energy and time must be devoted to marketing than was originally planned. Nevertheless, the numbers of people using `www.sanday.ch` are developing satisfactorily. In March 2002, we registered more than 500 visits each day without our having had to put out any public advertising previously. The goal of at least a million people visiting `wwws.sanday.ch` each year is a long way off, however!

3 User guide

The same information can be downloaded by users through different channels:

- Internet ⟶ www.sanday.ch

- Mobile phone with voice and keyboard control ⟶ 0800 sanday

- Mobile phone with SMS ⟶ medi

During the initial concept work, we assumed that a major number of mobile phone users had only bought one mobile telephone in order to be able to call people close to them in an emergency. This user group would only learn the most essential functions offered by their telephones. Voice and keyboard control was the solution implemented for this group of customers. The younger mobile phone user generation will have grown up with SMS and also transmit inquiries as SMS. However, younger persons will use the service less often because the topic of health is not yet relevant enough for them yet. Finally, Sanday is available on the Internet with the greatest number of functions.

4 Technology

4.1 Identifying the location of a mobile phone

Identifying the location of a mobile phone initially appeared trivial: all mobile phones are registered in a wireless cell. The wireless area theoretically covered is entered into a map and given coordinates that enable a mobile phone to be allocated to a surface area. This would allow the location of a normal mobile telephone in a town to be pinpointed with an accuracy of a few hundred meters and in the country with an accuracy of a few kilometers. This degree of accuracy appears to be adequate for our purposes. Unfortunately, it is the finer details that are the problem. Firstly, radio waves do not stop at predetermined borders and fail to stick to the theory, particularly in the case of lakes. Secondly, modern mobile telephony networks are equipped with a certain degree of intelligence that enables a wireless cell to switch in other cells dynamically when traffic is heavy. Several thousand Swisscom Mobile wireless cells are responsible for mobile services in Switzerland, usually from several directions even so that a mobile phone can receive several transmitters but is only ever registered with one cell. Thirdly, the surface areas covered by a wireless cell for the exchange of short messages and for telephony are different. The technicians faced and still face enough problems in the implementation of a functioning location service, the accuracy of which does not yet correspond to our original target but largely fulfils our requirements.

Only when a user calls up the service is he localized by the localizing service and the geographical information system connected receives, together with a coded user ID, the
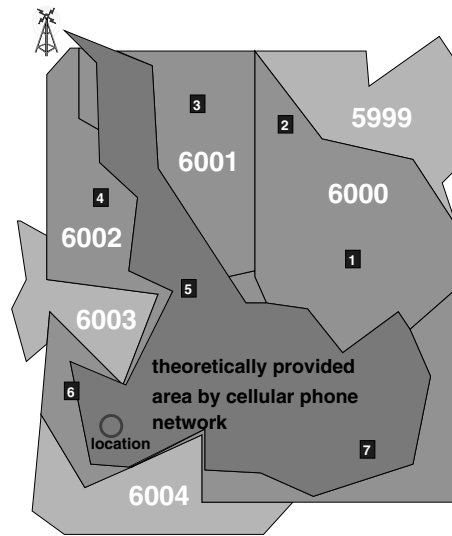
Figure 1: Postal codes covered by a radio cell

possible postal codes in which the caller might be located. This means that it is not the corners of a polygon (surface area theoretically covered by the wireless cell) that are transmitted but a list of postal codes, whereby the postal codes of the surface area covered are sorted in descending order. In the example described below, the localization service has returned the postal codes 6002, 6001, 6000. Within the postal code 6002, all addresses have the same probability of being displayed on the mobile phone as a result. The search for addresses provides a list of possible addresses for this purpose and one address is chosen at random from these. Service providers with the numbers 4, 5, 6 and 7 therefore have the same chance of being displayed even if, in the example, the address with the number 6 was closest to the actual location. However, the person calling can be located somewhere within the area that is covered by postal codes 6002, 6001 and 6000 and therefore all the service-provider addresses listed in the example fulfill the criterion of local proximity. Because postal code 6002 is most heavily covered, service providers in this postal code area are returned as priority addresses. If there were no suitable address there, the search area would be successively increased until at least one address is found.

4.2 Interactive voice response

Via the 0800 sanday (0800 726 329) telephone number, the person making the call is received by a synthetic voice (text-to-speech) and taken through a menu. Decisions can be taken via the keyboard:

1. Welcome with the Suva jingle.

2. Language selection (English, French, German, Italian).

3. Listening to important information (disclaimer, ninety centimes per call, only for Swisscom mobile customers). Customers still have time to cancel the call without being charged for it or their location being identified.

4. Selection of the service provider category (doctor's surgery, pharmacy, dental surgery, veterinarian surgery).

5. Dependent on the category selected, further selection from a sub-category.

6. Message stating that an address in the required service provider category can be received by SMS in the next few seconds and that communication will therefore be terminated.

When the call is over, the parameters are passed on via the Internet to the company Endoxon AG, which produces an SMS using the functions of a geographical information system and on the basis of the geocoded addresses and then transmits this SMS via the Internet to Swisscom, which transmits the SMS. The data is not transmitted in open form, but is protected.

Apart from the telecommunications provider Swisscom-Mobile, none of the participants know the telephone number of the caller. Only an unmistakable ID is passed on. At the end of the process chain is Swisscom-Mobile again, which decodes the ID and can send the SMS to the mobile telephone caller. The principles of this solution were examined by Swiss data protection specialists and accepted. Billing is also handled by Swisscom Mobile. Only in a subsequent phase and dependent on user frequencies we will be testing and implementing voice generation of the address. The caller would not only like to hear which telephone number the nearest medical service provider has but be connected with him immediately via a voice command.

4.3 SMS user guide

Young people and people young at heart can write and transmit entire letters using their mobile phone keyboards. Instead of calling a telephone number, the user writes a message with a keyword to the "medi" address (6334). The keywords for the message were compiled in four languages to avoid the need to select the language first. People who enter the text "médecin de famille" instead of "family doctor", will get the answer in French (although the program admittedly does not know whether perfect French really is spoken in the doctor's surgery found). People who do not enter a keyword get a reply in the form of an SMS with the address of the nearest family doctor.
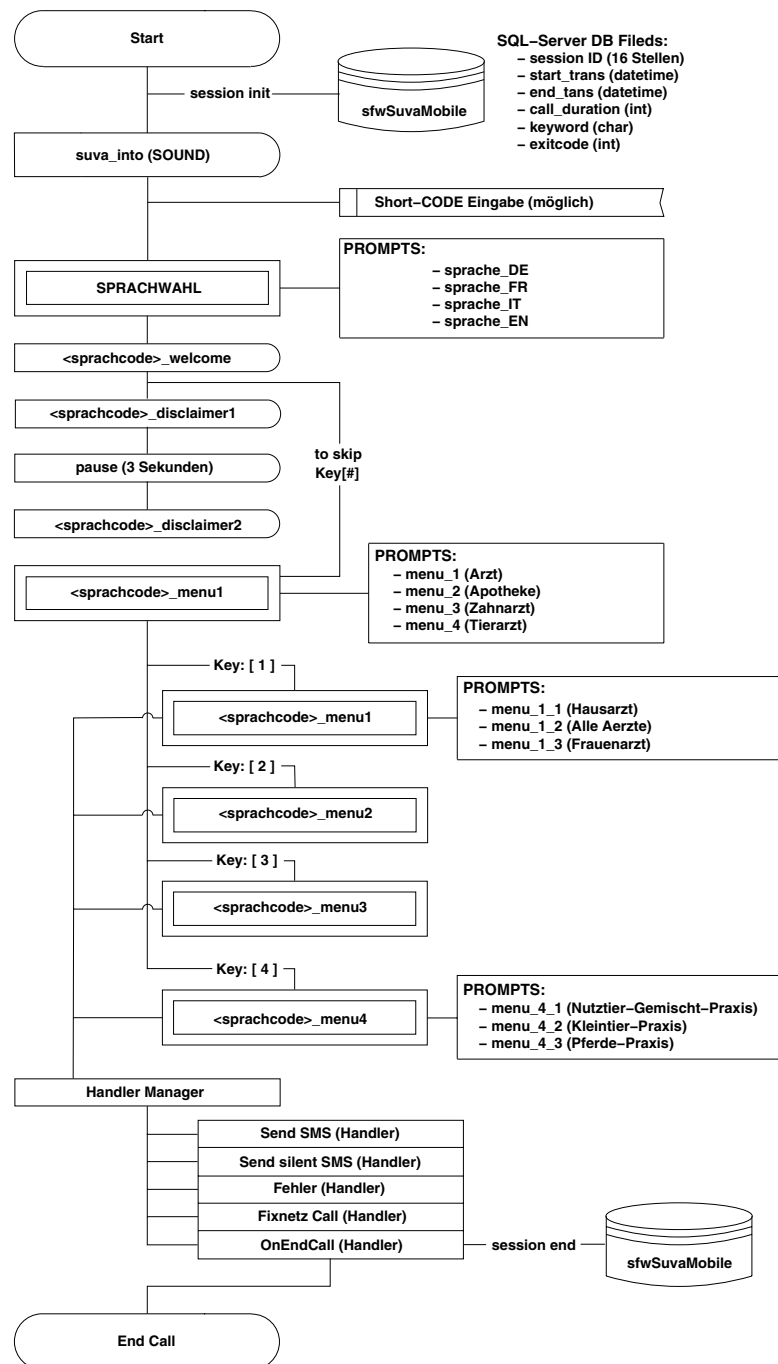
```
    ┌─────────────────┐                                    SQL−Server DB Fileds:
    │     Start       │                                      – session ID (16 Stellen)
    └────────┬────────┘        ╔═══════════╗                 – start_trans (datetime)
             │   session init  ║           ║                 – end_tans (datetime)
             ├─────────────────║sfwSuvaMobile║               – call_duration (int)
    ┌────────┴────────┐        ╚═══════════╝                 – keyword (char)
    │ suva_into (SOUND)│                                     – exitcode (int)
    └────────┬────────┘
             │              ┌──────────────────────────────┐
             ├──────────────┤ Short−CODE Eingabe (möglich) │
             │              └──────────────────────────────┘
    ┌────────┴────────┐        ┌──────────────────────────┐
    │  ┌───────────┐  │        │ PROMPTS:                 │
    │  │SPRACHWAHL │  │────────│   – sprache_DE           │
    │  └───────────┘  │        │   – sprache_FR           │
    └────────┬────────┘        │   – sprache_IT           │
             │                 │   – sprache_EN           │
    ┌────────┴────────┐        └──────────────────────────┘
    │<sprachcode>_welcome│
    └────────┬────────┘────────────────┐
    ┌────────┴────────┐                │
    │<sprachcode>disclaimer1│          │
    └────────┬────────┘       to skip  │
    ┌────────┴────────┐       Key[#]   │
    │pause (3 Sekunden)│               │
    └────────┬────────┘                │
    ┌────────┴────────┐                │
    │<sprachcode>_disclaimer2│         │
    └────────┬────────┘                │
    ┌────────┴────────┐   ┌────────────┴─────────────┐
    │┌─────────────┐  │   │ PROMPTS:                 │
    ││<sprachcode>_menu1│ │   – menu_1 (Arzt)        │
    │└─────────────┘  │───│   – menu_2 (Apotheke)    │
    └────────┬────────┘   │   – menu_3 (Zahnarzt)    │
             │            │   – menu_4 (Tierarzt)    │
             │            └──────────────────────────┘
             │  Key: [ 1 ]       ┌──────────────────────────────┐
             ├───────────┐       │ PROMPTS:                     │
        ┌────┴──────────┐│       │   – menu_1_1 (Hausarzt)      │
        │<sprachcode>_menu1│─────│   – menu_1_2 (Alle Aerzte)   │
        └───────────────┘│       │   – menu_1_3 (Frauenarzt)    │
             │  Key: [ 2 ]       └──────────────────────────────┘
             ├───────────┐
        ┌────┴──────────┐│
        │<sprachcode>_menu2│
        └───────────────┘│
             │  Key: [ 3 ]
             ├───────────┐
        ┌────┴──────────┐│
        │<sprachcode>_menu3│
        └───────────────┘│
             │  Key: [ 4 ]       ┌──────────────────────────────────────┐
             ├───────────┐       │ PROMPTS:                             │
        ┌────┴──────────┐│       │   – menu_4_1 (Nutztier−Gemischt−Praxis)│
        │<sprachcode>_menu4│─────│   – menu_4_2 (Kleintier−Praxis)      │
        └───────────────┘        │   – menu_4_3 (Pferde−Praxis)         │
    ┌────────┴────────┐          └──────────────────────────────────────┘
    │ Handler Manager │
    └────────┬────────┘
             │   ┌──────────────────────────┐
             ├───│  Send SMS (Handler)      │
             │   ├──────────────────────────┤
             ├───│ Send silent SMS (Handler)│
             │   ├──────────────────────────┤
             ├───│   Fehler (Handler)       │
             │   ├──────────────────────────┤
             ├───│ Fixnetz Call (Handler)   │
             │   ├──────────────────────────┤        ╔═══════════╗
             ├───│ OnEndCall (Handler)      │─────── ║           ║
             │   └──────────────────────────┘ session end║sfwSuvaMobile║
             │                                          ╚═══════════╝
    ┌────────┴────────┐
    │    End Call     │
    └─────────────────┘
```

Figure 2: Flow chart user guide

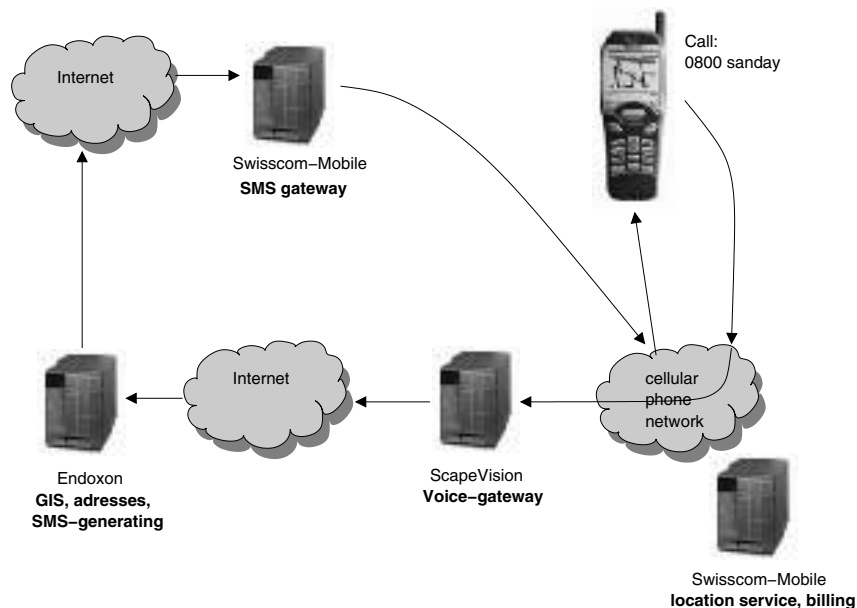Figure 3: The route taken by a call through the different function modules

4.4   www.sanday.ch

The Internet application is based on a geographical information system created by haht-software and MapInfo. In an initial phase, we used standard layer techniques, but soon realized that connection to a database was essential if work was not only to include maps but also lists. For this reason, the application was ported to Microsoft-Access 2000 as a database.

After starting the application, a search mask is displayed containing different search options:

1. I wish to find my location using an address known to me.

2. I wish to find a geographical object, for example, the Matterhorn (but there is no doctor's surgery up there).

3. I wish to locate the address of a medical service provider immediately.

It will also soon be possible to find a location using coordinates to enable places without postal addresses to be found.

After entering the location, the user is shown a map on which he can call up service-provider categories from the health service and which are displayed as colored boxes on

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Figure 4: Procedure when looking for a doctor

the map. When one of these hotspots is clicked on, an information window opens with detailed information on the address required.

5 Can Sanday save lives?

Sanday neither replaces a family doctor, an emergency medical service nor the emergency service available all over Switzerland via the 144 telephone number. Sanday is a localized information service for the Internet and mobile telephony and simplifies the task of finding medical service providers. At present, however, we are working out the basic aspects in a pan-Swiss survey of all people in charge of emergency medical services, in order to be able to display the locally valid emergency number everywhere. Emergency medical services are regulated at cantonal level in Switzerland and delegated to districts as well as sections in the cantons. Their organization is correspondingly heterogeneous in structure.

Figure 5: Search mask for determining locations and direct selection of the health address

Figure 6: Search result in the map and address category

HAUSARZT = 1	familienarzt, hausarzt, fam, familie, haus, praxis, 111	médecin de famille, cabinet médical, famille 211	medico, medico di famiglia, dottore, 311	family doctor, HMO, general, surgery, office, medical practitioner, 411
APOTHEKE = 2	apotheke, medi, medis, medizin, medika-mente, apo, apotheker, pharmazeut, apoteke, apotek, medicament, 12	pharmacie, médicament, médicaments, officine, pharmacien, pharma, 22	farmacia, medicina, farmacista, medicamento, medicamenti, 32	pharmacy, drugstore, medicine, medicaments, chemist, pharmacist, 42
ZAHNARZT = 3	zahnarzt, zahn, zahni, zani, dentist, 13	dentiste, dent, dents, 23	dentista, dente, denti, 33	dentist; tooth, teeth, 43
TIERARZT = 4	tierarzt, tier, veterinär, veterinaer, tierdoktor, 14	vétérinaire, médecin, vétérinaire, animal, animaux, bétail, 24	veterinario, animale, animali, dottore, 34	vet, veterinary, veterinary, surgeon, animal, veterinarian, animals, 44

Table 1: Screenshot of the conversion table for Sanday LBS

6 Sanday as a platform

Sanday is already being used as a platform for another project. The Health and Public Welfare Department of Canton Berne has implemented a pilot project for a bed-monitoring system called "BEL-net" based on Sanday and started to use it in eight hospitals. Twice a day, the hospitals' free bed capacities are entered into a database. Whenever a hospital bed is required for a patient, someone in the emergency center can look for a free bed with a few clicks of a mouse.

Sanday is a project and a product and research all rolled into one. In its current form, it is still a long way from our vision, but is a basis for new ideas that help to improve information levels in the health service and make them more widely available.