A Potential Way for Efficient Information Sharing Based on Mobile Text Messaging

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Abstract—**These days most educated individuals own a mobile phone that is rapidly becoming one of their primary and main commutation devices. The most basic mobiles are able to send and receive text messages, which are normally considered to be the most energy efficient and cheapest commutation method. This paper was inspired by the simple communication method used in mobile devices, Short Message Service (SMS) or text messaging, creating an efficient geographical information sharing platform for ubiquitous and volunteer data gathering. With the help of two open SOA platforms 1) Skype cloud SMS-gateway, and 2) Sensor.Network a web of things platform, we were able to create a globally accessible information platform which is capable of receiving spatial information via SMS from anywhere anytime. This information platform is compatible with the Open Geographical Consortium (OGC) standards and all data can be accessed via the web services for further process and sharing purposes.**

Keywords-component; geographical information system (GIS); green platforms;internet of things (IoT); mobile phones; text messaging; volunteer data collection; web of things;

I. INTRODUCTION

The importance of data acquisition has never been underestimated. Understanding how things work and making decisions based on the collected data is the primary purpose of data collection. To forecast big problems, such as environmental issues, the more data is gathered from different aspects, the easier to find problems and their answers. Furthermore, without structural approach in storing and collecting data and proper interpretation, the raw data would be worthless; this highlights the importance of information system and platforms.

Nowadays most individuals own mobile phones and it has turned to one of the most important and predominant ways of communication and sharing data [1]. Although new generations of mobile phones are capable of using the latest technologies and modern communication methods (e.g., Wi-Fi, VoIP calls, etc.), in most situations, text messaging is still the cheapest and less power consuming method of communication.

As opposed to text messaging that the communication channels are only used while sending the packets, the basic phone telephone calls will consume lots of energy to activate the speaker, the microphone, also establishing and keeping the connection of your phone with the cellular stations. Also if using wireless technologies (i.e., Wi-Fi, Wi-max, Bluetooth, Zigbee, and etc.), the total power usage would be higher due to wireless card activation; not to mention their limited coverage, compared to cellular networks. Other facts about text messaging are the fairly small size packets of 160 characters; more interestingly, the average open rate of 98% compared to 22% in emails, according to study's in [2, 3].

The objective of this paper was creating an efficient information platform, with the focus on collecting pervasive mobile device information from volunteer mobile owners. This platform had been created as part of SensorML-NT project that aimed on finding a new way to use mobile devices to handle the environmental issues; this contributed to use mobile devices as sensing nodes, since mobile phones are pervasive and equipped with powerful embedded sensors (i.e., microphone, GPS, camera, etc.) they create an unsought worldwide sensor network. On the other hand, the contribution of this paper was to create an efficient centralized data gathering platform, for geographical information systems, which is both user-friendly and especially transparent for the user.

The paper is organized as follows. Section II reviews the current state of the art. Section III briefly discusses the proposed model of the information platform and introduces and presents a sample simulation of the proposed methodology. Section IV discusses the main properties of the platform in theoretical and qualitative terms. Section V concludes the findings. Finally, further work is introduced in section VI.

II. CURRENT STATE OF THE ART

Many of our decisions depend on the details of our immediate surroundings and are the result of data study from specific locations and times. To apply general principles to a specific condition or location, track of what is happening at different area, also to help understand how one place differs from another there is a need for information. Information systems platform is a network of hardware and software, which allows sharing, processing and distribution of information and data. A number of feasibility studies have been conducted to find the best solution for information platform. Some groups focused on different data gathering

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and information sharing technics. Others try to solve challenges to creating useful information from the raw data.

Although mobile devices are improving each day, there are still large numbers of challenges existing. Limitations such as memory, processing power, batteries and the communication channels, imposes great difficulties to provide user as an option to solve complex problems [4,5]. Relatively, several attempts such as high performance computing (HPC)(i.e. grid and cloud services), have been addressed by previous authors to overcome the limitations of the mobile devices.

References [6-9] employed a proxy based architecture solution, as the central of the infrastructure, that allow the local mobile devices look ahead to the next generation of WSRF-GRID infrastructure (Web Services Resource Framework). A result of proxy-based grid system, a favorable deployment, interoperability, scalability, adaptively, and fault-tolerance platform is emerge. However, they have limited mobility and global coverage, also restriction to certain type of APIs and hardware.

Due to the nature of the mobile devices, they are widespread and present everywhere (especially at the same time) around the world, they build an unsought large scale sensor network [1, 10]. Using mobile devices as sensors has several advantages over basic wireless sensor network. Providing a wider coverage also lowering the cost, where static sensors are hard to deploy or cannot be installed. Note that, No single entity can place sensors across the complete coverage domain required by an application, such as subways, public parks, shopping malls, and hotels. Additionally, there might not be a need for sensors to be available at all times, more relevant and useful data will be collected, with the assist of the human user. For instance, aiming the sensors, to a particular direction for data collection. For instant, in case of flood, fire or natural disasters, where the events and are not predicted. [11] Introduces data collection, using the mobile phone, to capture voluntary data.

Lane *et al.,* mentions, in spite all the research, "mobile phone sensing is still in its infancy" [1]. Furthermore, without correct and proper interpretation, the raw data that is collected by the mobile devices are worthless. This highlights the importance of information systems and platforms.

Numerous works related to the fields of information systems, GIS and OGC sensor web enablement (SWE) has been carried out. As a representative in the area, Asian Institute of Technology develops an infrastructure for Sensor Asia, outlines the problem, where it requires highly skilled engineers to set up a sensor network. Honda et al., introduces Sensor Service Grid (SSG), which integrates fieldserver and Web GIS to realize easy and low cost installation and operation for the ubiquitous field sensor network, designed to supports sensor "Plug and Play" [12]. However the designed architecture of the GIS Station is quite complicated; itself, consist of a fieldserver combined with a small Linux-Box which gives a high capability of storing sensor data and provides data connectivity. Since the sensors are connected via feeders designed for that particular sensor, the sensors would be restricted to certain types and have mobility constrains.

III. Methodology and Implymentation

This section induces the selected techniques along with an experiment of the proposed information platform. The implementation of the information platform is composed two main parts: first, the client side, second, the server side that runs all services.

The client side or mobile phones are used as sensors, to create a richer database, by gathering and sending data from different locations and times to the server side. Open GeoSMS specification has been selected to facilitate the communication between the client side devices and server side services [13]. Open GeoSMS is designed to be used by SMS capable devices or applications to facilitate communication and sharing of location based serviced (LBS) data. Due to the use of SMS, this standard is a practical and a convenient way, which may reduce cost, time, and human resource, since there is no need for the existing systems or infrastructure to be changed.

The server side, itself, consists of 3 different parts:

- First, a receiving port to collect the data which is sent from the mobile devices; since this work has been using text messaging as the commination method, a SMS-gateway is used to collect the incoming packets. The SMS text message send from the mobile device will be received from the cellular base stations, and from there redirected to the receiving phone line. More specifically, this work has choice to use the Skype-SMS-gateway, due to the free service; however, any other SMS-gateway can be installed.
- Second, the translating SOAP web service, which converts the packages received from the SMS-gateway to useful information. This research work uses SensorML-NT server, a SOAP web service that convert the GeoSMS packages to OGC SensorML format [14]. Since the SMS packet received from the cellular base station contains personal information (i.e., telephone number, current location, etc.) of the mobile device, SOAP web services were the preferred method; due to the secure packaging of this transferring method of the servers.
- Third, the data exchanging information center. This subsection contains all the information available on the information platform. For this research work Sensor.Network has been selected [15,16], an open restful data exchange web service for the web of things. The final information created by the translating web service is capsulated in rest package and inserted in Sensor.Network streamers, to be later accessed by users, restful web services and software can for further use.

The proposed information platform along with a sample experiment is of illustrated in Fig. 1. For documentation purposes, a simulation of GeoSMS program is developed for

mobile devices with Windows Mobile operating system, in C#.net environment.

IV. Discusion

This section highlights the main properties of the proposed platform in qualitative terms. In terms of heterogeneity, SMS capable mobile devices, regardless of their specific hardware or software and operating system can be connected to the platform.

The mobile user will only need to sending the text message to the SMS-gateway, (In the experimental GeoSMS program the message is send to Skype-SMS-gateway, +41762203200), and the rest of the process and transformation done in a transparent and automated manner. This also enables future scalability of the information platform by extending the server side recourses, which would also be hidden from the user.

Having in mind, Mobility increases the overall accessibility [6]. Furthermore, the availability due to the global coverage of cellular networks would have direct effect on data gathering and information scaling; Proxy based communication are a "green" applications and services approach, which will highly help the energy reduction of end-hosts and improve the performance [17]. All of which, results to a transparent and user-friendly platform that also has direct impact on motivation of volunteer data gathering.

V. Conclusion

Some of the main problems existing in the area of information sharing are the challenges faced while establishing a connection, the high power consumption of these data transferring methods (especially in non-profit and volunteer uses).

This paper detailed the justification for pursuing text message communication for a potential way of efficient resourse sharing. The centralized information platform consisting of: (1) a web-service for global sharing of the information and (2) a SMS getaway for communicating with mobile phone, a plug and play and transparent Information Sharing platform has been created.

The platform is ideal for ubiquitous voluntary data gathering, since it is re-using the available technology and physical system, there is no need for extra equipment or API compatibility. Most importantly, it is a cheap and light weight and energy efficient way for mobile users.

VI. Future Work

Although, we have used the free available services for our testing platform, due to our budget and time constrains purposes, they can easily be changed and rewritten for private or commercial information platform using a SMS getaway and a data hosting web service for storing the information.

Since all parts of the information platform are loosely coupled, each section can be easily scaled with help of cloud services technologies.

Lastly, the scope of this research paper was limited to Geographical information systems; therefor the selected standards and systems are all selected and compatible with OGC specification. However, the proposed platform could be easily redesigned for other sensor web and information systems, with the same advantages.

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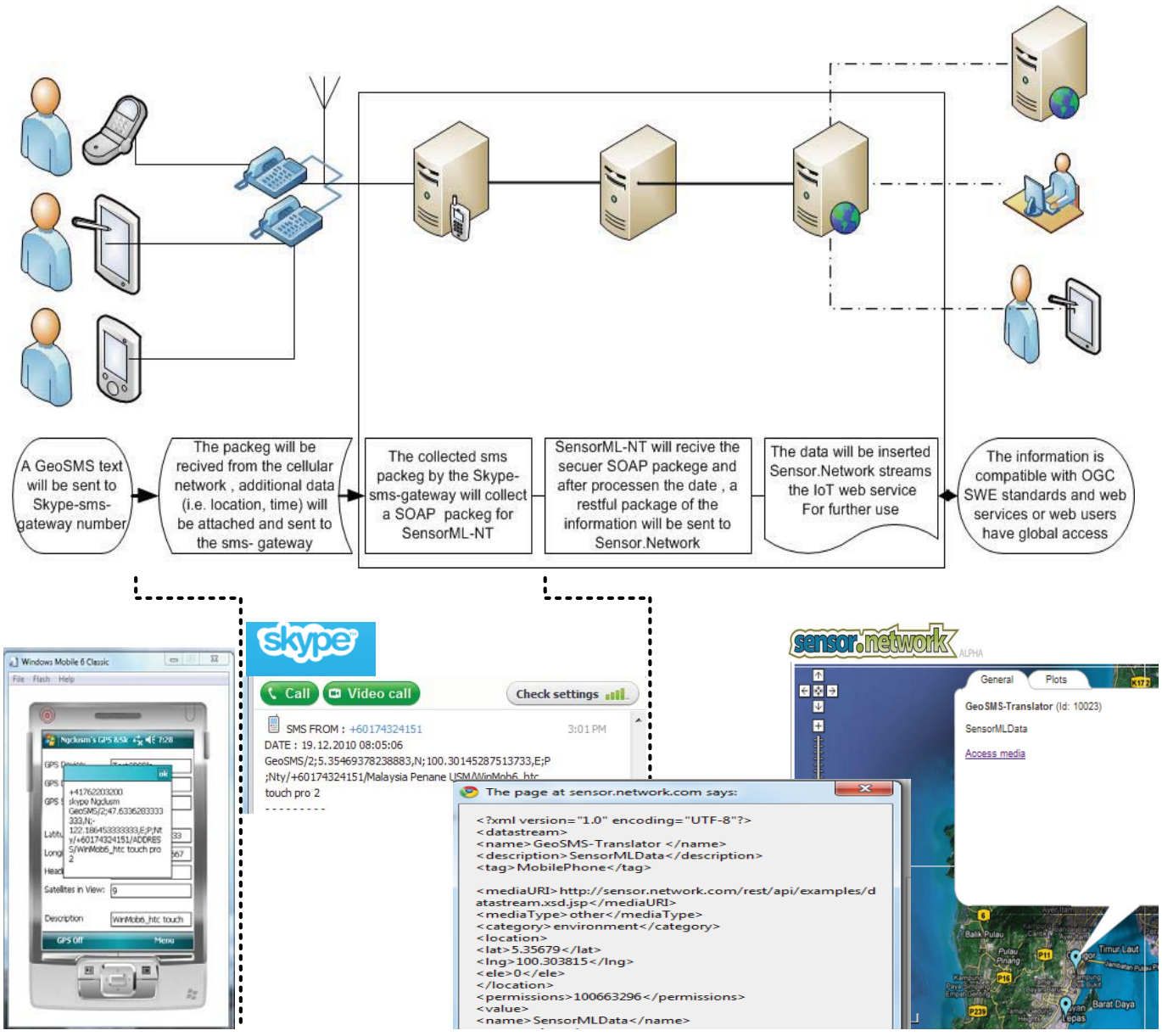

Figure 1. Illustration of the proposed information platform and a sample of experiment.