The South African address standard and initiatives towards an international address standard

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Abstract

Various countries and international organizations have address standards or are developing them. An address is needed for many more applications than just postal delivery, such as: goods delivery; connecting utilities; opening bank accounts; voting; visiting friends; and providing a reference context for presenting other information. The benefits of an international address standard include: enabling address interoperability across boundaries; reducing service delivery costs; enabling development of addressing tools (including open source); and assisting countries with inadequate addressing systems to implement and maintain them. The idea is not to develop one address structure imposed on everyone, but rather a framework and vocabulary for describing address data around the world, to enable interoperability. The South African address standard, SANS 1883, does not aim at devising a new system of addressing or building a national address database, but rather at enabling interoperability in address data. The standard defines twelve address types currently used in South Africa, both official and unofficial. A paper exploring the possibilities of an international address standard was presented at the GSDI-10 Conference in Trinidad in February 2008. An ISO Workshop on address standards was held in Copenhagen in May 2008, attached to the meetings of ISO/TC 211, Geographic information/Geomatics. This paper reports on these activities and others, considering issues such as:

- *Is an international address standard feasible?*
- *Should it be descriptive, prescriptive, or both?*
- *What mechanism should be used for developing it?*
- *What should it include (eg: vocabulary, ontology; geo-referencing and a reference model)?*

1. Introduction

1.1 Objectives of this paper

This paper reports on activities leading towards the development of an international address standard, the implications for the South African address standard and how its diversity of address types could contribute to an international address standard. It considers whether an international address

standard is feasible; whether it should be descriptive, prescriptive, or both; the mechanisms that could be used for developing an international address standard; and what it should include, such as a vocabulary, an ontology and/or an overarching reference model.

1.2 Overview of addresses

Coetzee *et al* (2008a) compared various characteristics of ten address standards, including the definitions of '*address*' that they used. Cooper (2008) drew on this to identify the commonalities between these definitions, and used them to produce the following definition of an *address*:

A structured, unique, complete, common reference for
actual or potential service delivery to a location.

As can be seen from this definition, an address should be considered more broadly than just a set of directions for delivering post or for courier services. An address is also used for a wide range of public and private service delivery, including goods delivery, planning infrastructure delivery, connecting utilities, billing, emergency dispatch, household surveys, serving summonses, and land and property registration. Addresses are also critical for services that are not necessarily performed at the address, such as for rates and taxes, opening bank accounts, buying on credit, securing an identity document, voting, obtaining employment, conducting household surveys, visiting friends; and providing a reference context for presenting other information. An address can also give people a status, by showing that they are part of society (Coetzee & Cooper, 2007b), and hence in a position to receive services on demand because they can be 'found'. In some respects, having an address places one in the 'surveillance society', where one only exists if the system can put one under surveillance (Cooper *et al*, 2008).

Addresses don't live in isolation, and are widely recognized as being a key form of geospatial information. For example, INSPIRE (INfrastructure for SPatial InformationN in Europe) is a European Directive (i.e. law across the European Union) for developing a spatial data infrastructure (SDI) for Europe. Annex 1 of the Directive identifies nine priority spatial data themes, one of which is 'addresses' (European Parliament 2007). Addresses are used every day by citizens, businesses and government as a human understandable description of the location of a specific piece of information (Coetzee *et al*, 2008a).

1.3 Overview of address standards

Various countries around the world have address standards or are in the process of developing them, including Australia and New Zealand (as a joint effort), Denmark, Korea, the United Kingdom and the United States of America. In South Africa, the address standard currently under development has three parts:

SANS 1883-1, *Geographic Information – Address Standard, Part 1: Data format of addresses.*

SANS 1883-2, *Geographic information – Address Standard, Part 2: Guidelines for addresses in*

databases, data transfer, exchange and interoperability.

SANS 1883-3, *Geographic information – Address Standard, Part 3: Guidelines for address allocation and updates*.

Some international organizations have developed or are currently developing address standards. In implementing the INSPIRE Directive, the European Union has established the INSPIRE Thematic Working Group (TWG) on Addresses to develop implementing rules and data specifications for addresses. There are also plans to develop a European Address Infrastructure, through the EURADIN project. The Universal Postal Union (UPU) has an international standard for postal addresses (S42: *International postal address components and templates*). The Organization for the Advancement of Structured Information Standards (OASIS) has a suite of XML specifications for party (people and organisations) related data, including addresses (physical locations or mail delivery points) with geospatial coordinates.

Coetzee *et al* (2008a) assessed ten address standards against a variety of criteria, such as the standard's status; its purpose; the availability of supporting material; whether the standard supports geo-referencing with coordinates, postal addresses and non-postal addresses; if the standard has a data model; and whether the standard includes metadata and descriptions of data quality. They found that most of these address standards:

- Included geo-referencing by coordinates;
- Described *all* kinds of addresses (as opposed to only postal addresses);
- Provided data models;
- Used UML to describe their data models; and
- Used XML as an encoding format.

They also found that some of the standards included metadata and some information on data quality, though they concluded that the trend is to use a separate standard for data quality (Coetzee *et al*, 2008a).

Two standards from ISO/TC 211 provide the framework for spatial referencing, that is, for specifying where something is:

- ISO 19111:2007, *Geographic information – Spatial referencing by coordinates*, which describes the structured metadata (both human and computer readable) required for using coordinates, covering coordinate systems, coordinate reference systems and coordinate transformations, as well as types of coordinates.
- ISO 19112:2003, *Geographic information – Spatial referencing by geographic identifiers*, which describes how to link something to a location without explicitly using coordinates, but through a relationship to a location defined by a geographical feature (i.e. something with a name or identifier).

While computers might ‘prefer’ addresses expressed as coordinates, for human use, an address should be a form of spatial referencing by geographic identifiers, i.e. containing intelligible names and

context, such as a hierarchy of names (e.g. street, suburb, town, province and country) (Coetzee *et al*, 2008a).

1.4 Previous attempts at an international address standard

As far as we can gather, there have been few attempts to date to develop international address standards. A significant standard has come from the UPU, with their standard *S42: International postal address components and templates* (UPU 2006). Previously, in collaboration with ISO/TC 154, *Documents and data elements in administration, commerce and industry*, the UPU had developed ISO 11180:1993, *Postal addressing*, but this standard was only for the dimensions and location of the postal address on forms, and was withdrawn on 15 January 2004. Other postal address standards include the one being developed by the European Committee for Standardization (CEN), EN 14142-1:2003, *Postal services – Address databases – Part 1: Components of postal addresses.* , and, as identified by OASIS (2002), several from industry consortia that use only simple address lines without trying to interpret international addresses.

OASIS, an industry consortium, has a suite of XML specifications for *party* related data, where a party could be a person or an organisation, such as a company, association or consortium. In the OASIS specifications the focus for addresses is on standardizing addresses that are used in conjunction with such a party. The XML specifications are:

- *xNL: extensible Name Language*
- *xAL: extensible Address Language*
- *xNAL: extensible Name and Address Language* (combines xNL and xAL)
- *xPIL: extensible Party Information Language*
- *xPRL: extensible Party Relationships Language* (OASIS 2007).

ISO/TC211 has developed ISO 19133:2005, *Geographic information – Location based services – Tracking and navigation*, which includes an address model to describe a location for tracking and navigation that is acknowledged to be tentative. ISO/TC211 is currently developing ISO 19148, *Geographic information – Location based services – Linear referencing*, which will prescribe the data and services needed to support locations defined by distances along linear features from a known point.

1.5 Benefits of an international address standard

Recent presentations at the 2007 Urban and Regional Systems Association (URISA) annual conference describe the value of standardized addresses to the economy, society and governance in the countries of Denmark (Lind 2007), South Africa (Coetzee & Cooper, 2007a) and the United Kingdom (Barr 2007; Nicholson 2007). Coetzee et al (2008a) drew on these to assess how these benefits of address standardization can be internationalized. Some of the benefits include enabling address interoperability across national boundaries; reducing the costs of service delivery; generating down-stream economic activities; enabling vendors to develop addressing tools (including open-source tools);

and assist those countries with inadequate addressing systems (as is the case in much of Africa) to implement and maintain comprehensive addressing systems.

Corbin (2007) has pointed out that the key driver for address standards is providing wider access to what already exists. For example, in most European countries there are restrictions on address registers that result in such registers within the public sector not being used effectively. With the aging of society (especially in Europe), there is a need to simplify rapidly current activities to be able to sustain services as the work force shrinks. Key to this is releasing resources currently deployed, such as the duplication in building and maintaining address registers because they are not shared (Corbin 2007).

2. The South African address standard

During 2004, the South African Bureau of Standards (SABS), through its committee SABS/SC 71E, *Geographic information*, began a project to develop a South African National Standard (SANS) for "*a standard framework for South African addresses*". The aim of this standard is not to devise a new system of addressing or to build a national address database, but rather to enable interoperability in address datasets and geographical information systems (GISs), which will facilitate developing a national address database (Coetzee & Cooper, 2007b). The standard was subsequently given the designation SANS 1883 and consists of three parts (as described above), all currently at the Committee Draft stage. The SANS 1883 project meetings have enjoyed broad participation by more than thirty organizations across South Africa, and others have provided inputs via correspondence. The project team was also awarded a Global Spatial Data Infrastructure (GSDI) Small Grant that allowed some team members to travel to project meetings in Gauteng.

Currently, no one has the authority to enforce address standards in South Africa. In any case, the priority is to assign addresses now, rather than to enforce address standards. Coetzee & Cooper (2007b) made a crude estimate that about half of the needed addresses have been assigned, with the backlog being between 4 and 6 million addresses. Hopefully, SANS 1883 will help to reduce the backlog, by providing a common framework and terminology for addresses, allowing organizations assigning addresses to share their addresses, rather than duplicate them. SANS 1883 then does not *prescribe* addresses or address formats, but rather *describes* the 12 types of addresses used in South Africa (SANS 1883-1).

SANS1883 has drawn from similar standards elsewhere. The project team members have drawn on their experience with SANS 1883 to contribute to the development of an international address standard, such as through the ISO Workshop on address standards, as described below in Section 3.

3. ISO Workshop on address standards

During the meetings of ISO/TC 211, *Geographic information/Geomatics*, in Xi'an, China, on 31 October 2007, an informal meeting was held with delegates from South Africa, Australia, Denmark, Japan, the International Association of Oil and Gas Producers (OGP), United Kingdom and the United

States of America, to discuss holding a workshop on standards for addresses, attached to the following ISO/TC 211 Plenary (the 26th) in Copenhagen, Denmark. The *ISO Workshop on address standards: Considering the issues related to an international address standard*, was then held on Sunday, 25 May 2008. It was hosted and sponsored by the Danish National Survey and Cadastre (KMS) and held under the auspices of ISO/TC 211's Working Group 7, *Information Communities*, in collaboration with the European Address Forum. Together with Morten Lind of KMS, the authors arranged the workshop and edited the proceedings (Coetzee *et al*, 2008b), which are available online at:

http://www.isotc211.org/Address/Copenhagen_Address_Workshop/index.htm

The workshop provided national and international perspectives on address standards. The purpose of this workshop was to consider the issues related to an international address standard:

- What is an address?
- What is the definition of an address in current national address standards?
- What is the scope of current national address standards?
- Why do we need a national address standard?
- Can we benefit from an international address standard?
- Is there enough reason to move ahead with an international address standard?
    - If yes, what should the scope (more or less) be and how do we proceed?
    - Should we start with a Stage 0 Review Summary of the issues?

Well over 40 people attended the workshop (including members of the INSPIRE TWG on Addresses), which was more than expected. The programme included presentations from ISO/TC211's Chair and Convenors of WG 7 and WG 10, *Ubiquitous public access*; INSPIRE; the UK; South Africa; Australia; Japan; the US; the Universal Postal Union (UPU) and Denmark. The following is a summary of the salient points from these presentations.

Cooper (2008) provided the background to the workshop and gave an overview of an address. As mentioned above in the Introduction, he drew on the work of Coetzee *et al* (2008a) to identify the commonalities between various definitions to produce a composite definition of an address. He also presented a preliminary taxonomy of addresses, which could be used to identify for which types of addresses a standard caters, and for it does not. He concluded by presenting three models for an international address standard:

- A *toolset* that could be drawn on for describing or building an address standard. These tools could include the common terms and definitions of an address, address elements and related concepts (as a vocabulary or an ontology); and/or a framework for describing an address system.
- The *superset of all other address standards*, incorporating all their different concepts of addresses, address elements and related concepts. Superficially a good option, in practice it will invariably produced an unwieldy standard that is difficult to use.
- The *universal interface between other standards*, providing the general model of an address,

address elements and related concepts, as opposed to being merely a collection of special cases.

Coote (2008) identified three key issues that the INSPIRE TWG has encountered to date, and one that will be an issue in the future. These are probably issues for other international standards development initiatives, as well:

- Language: English is the language used for their deliberations, yet it is not the first language of most of the TWG. It is difficult enough engaging in complex, detailed arguments in one's first language, without the added complication of using a second or third language.
- Distributed Team: While teleconferences and email help, there is no substitute for face to face meetings for debating key conceptual issues.
- Cross-theme Overlaps: Eight different TWGs are working in parallel on the priority themes in Annex 1 of the INSPIRE Directive, with the scope of the Address TWG intersecting so many different themes.
- Once a proposed standard has been completed by the technical experts, it is another challenge to take it through the management and political debates to get it adopted and implemented.

Walker (2008) concludes that addresses can be created for a variety of addressable objects, and not just those that receive mail deliveries. He feels that the issues of addressing are about data management, not data formats, with the primary requirement for standards being a definitive dataset of addressable objects of particular types. Rules are also required for naming and numbering properties, streets and the geospatial areas used in addressing. The maintenance of a standard address dataset requires:

- Definition of categories of addressable objects;
- Adoption of core address components;
- A clear address lifecycle;
- A rule base to manage other aspects; and
- Data management and quality management.

Hong (2008) identified the challenge of extracting unambiguous location information from the maze of different address formats. He considers the location information of a feature to be easily discoverable in ubiquitous geographical information (UBGI) environment, through using a *geo-labelling* mechanism, which facilitates exchange without further conversion or transformation through an overarching mechanism for spatial referencing using a dynamic position identification scheme, such as u-position (Hong 2008). If geo-labelling depends on government initiatives, though, it will be a major challenge to find the resources required in a country such as South Africa. However, if it can become a popular application on mobile telephones, it will generate its own momentum to make the resources available.

Coetzee (2008) feels that countries such as South Africa would benefit from an international address standard in several ways:

- Promoting the development of addressing tools (eg: for geocoding addresses), both commercial and open source;
- Providing consultants with tools that could be re-used at various local authorities, building an address-related skills base;
- Fast-tracking the assignment of addresses in previously unaddressed areas;
- Establishing a common vocabulary for addresses and related concepts;
- Promoting address data interoperability, thus enabling the exchange of address data and facilitating the collation of address data into larger databases, such as for governance in a country (elections, surveys, etc).

For address data bases, Coetzee also proposes using a *data grid*, a form of service-oriented architecture based on web services and free from centralized control, that allows data from multiple organizations and their administrative domains to be presented as a single virtual dataset (see also Coetzee & Bishop, 2008). She concludes that the South African address standard can contribute to the development of an international address standard because of the variety of address types used in the country.

Hockaday's (2008) presentation included an animated clip illustrating the new form of rural addressing in Australia, which is a useful tool for promoting the correct use of address standards and other countries could consider developing similar promotional material. He pointed out that there was no benefit to Australia or New Zealand in having a new international address standard to replace their existing standards. However, the benefits of an international address standard include providing a consistent method of locating and addressing addresses and facilitating automatic sorting for national and international mail. Australia has found that their address standards have helped emergency services provide quicker responses by re-aligning the catchments for fire stations better and by providing more accurate locations for rural addresses.

Plews and Kawano (2008) presented a conceptual framework for the description of Place Identifiers (PIs), which provides a simple, flexible structure that allows each community to use their own identifiers (retaining uniqueness within their respective community), yet facilitating representations of common places between communities. The PI framework defines services for the registration, management, conversion, discovery and exchange of PIs. The PI framework caters for spatial referencing by coordinates and by geographical identifiers, such as addresses. They have discovered that the same place is often described differently between user communities, and feel that the PI reference model could facilitate linkages between different addressing systems. They conclude that there are many issues to be resolved before an international address standard could be developed, and that future workshops such as this one should be planned.

Anderson presented on behalf of the Address Standards Working Group (Wells M *et al* 2008), the street, landmark and postal address data standard proposed for the USA. It defines the address elements and attributes needed for database records, data validation and documentation, data exchange and

creating mailing lists. It classifies addresses by their internal syntax, rather than their business purpose, and provides an address reference scheme (local rules for assigning new addresses and checking old ones). It provides for geo-referencing addresses to both coordinates and linear referencing. The proposed standard includes metadata and data quality tests. In conclusion, the ASWG believes that address elements vary little from country to country and that syntaxes will vary more, and would like to correspond with other groups following similar approaches to the creation of a national address data standard.

Jones and Lubenow (2008) discussed the UPU's postal addressing standard (UPU S42) 2006, which uses templates to define an address in a destination country so that it can be used by all the members of the UPU and their postal operators. The templates are described in a human-readable notation and in XML. The international postal addressing standard is an important prerequisite for effective postal operation and interconnecting the global network. Its key benefits are:

- Improves the value of mail as a means of communication;
- Efficient processing of international mail, even to the extent of being as efficient as domestic mail;
- Promotes the compatibility of UPU and international postal initiatives;
- Supports automation compatibility, barcode accuracy, postage payment accuracy, and timely and consistent processing, and reduces operational and delivery costs; and
- Improving the efficiency and reliability of mail enhances the value of mail as a communications medium, resulting in increases in the volume of mail.

They feel that it is essential for any international address standard to be based on address elements to avoid customized parsing of elements for every country, language and script. They conclude by pointing out that without a delivery point data base, users of the UPU S42 templates can identify addresses which are definitely invalid (because they are incomplete or wrongly structured), but with a delivery point database, they can identify valid addresses, so the UPU is helping its members establish databases of postal information including delivery points.

Lind (2008) suggested that an address system is democratic because it is in the public domain; it is useful even for those without technical devices; and it is known and recognized across all age groups, professions, and branches of public management, and across national boundaries. Where they exist, addresses are an essential tool for locating phenomena, events or information important for citizens, businesses and public administration. From the 1980s, the common address data concept and format in Denmark facilitated coordination and data interchange between the population, building and dwelling, and property assessment registers, and from the 1990s the business entity register as well. For example, this enabled censuses to be conducted several times a year, using the registers. However, the common data format does not ensure that the address content is the same across the registers. Their approach has been to treat addresses as independent objects types (as opposed to being attributes or properties of other object types), to which other object types would be linked. He concludes with several key points

concerning addresses:

- The authority of the address system needs to be clearly defined (if possible by law) and the custodianship of address data needs to be transparent;
- Address data must reflect the real world addresses;
- Address data must be updated and unambiguous in order to avoid errors, uncertainty and mistakes;
- Address data should be available for all users with as few barriers for use as possible;
- Address data should be standardized and well formed to enable efficient data processing and to provide the best possible competition between different application vendors; and
- Generic regional or global standards should enable use of, and access to, address information seamless across borders and regardless of differences in address schemas, etc.

Østensen (2008) concluded the workshop by identifying the possible role of ISO/TC 211 in developing an international address standard. ISO/TC 211 has several standards related to addresses, such as ISO 19112:2003, *Geographic information – Spatial referencing by geographic identifiers*. Key issues in the development of an international address standard include:

- The need to address and respect cultural and lingual differences, which could require a framework (abstract) standard at a sufficiently high level;
- The standard should be globally relevant and consider the various national standards and activities, and should not aim to replace working standards;
- It should ensure that the domain is mature enough for standardization and draw on existing good practices, such as from the project EURADIN (EURopean ADdresses Infrastructure);
- There must be a clear scope and justification for the standard.
- The ISO timelines for developing standards need to be considered;

A possibility is to begin with a Stage 0 Review Summary to identify exactly what aspects of addresses should be standardized. These could include an address ontology, information model, encoding and/or access services.

4. The way forward

Coetzee *et al* (2008a) outlined various organizational routes towards developing an international address standard, such as using industry consortia, inter-governmental agencies or open standards generating bodies, giving benefits and disadvantages for each. They favoured using ISO as they felt that would allow the broadest participation from governments, academia, industry, NGOs, civil society and international organizations such as UPU and OASIS. To promote accessibility to the standard documents, they suggested either developing it as an overarching abstract standard, from which national profiles can be developed, or as a joint project with an international organization that makes their standards available for free to the general public. They also felt that ISO/TC 211 should take the lead, as addresses are a fundamental geospatial data theme and as ISO/TC 211 has already developed

several standards directly applicable to an international address standard (Coetzee *et al*, 2008a). As detailed above in Section 3, Cooper (2008) outlined three models that could be used for the international address standard: a toolset, the superset of all other address standards, or the universal interface between other address standards.

Currently, in collaboration with UPU, the INSPIRE TWG on Addresses and others, we are exploring the options for establishing a mechanism within ISO for developing a suite of international address standards, which could start with four parts for a reference model for address data; the terminology for addresses; turning UPU's S42 into an ISO standard; and a standard on electronic exchange of name and address data, which UPU is initiating.

5. Conclusions

This paper outlines the nature of addresses and address standards and reports on activities leading towards the development of an international address standard, including providing a detailed review of the presentations at the *ISO Workshop on address standards: Considering the issues related to an international address standard*. This paper also considers where SANS 1883 fits into the development of an international address standard, and how its diversity of address types could contribute to an international address standard. We believe that the development of an international address standard is worth exploring, that the standard should be descriptive for the content but prescriptive for the exchange model.

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