The Cadastre as a Cornerstone in the Information Society Infrastructure

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ABSTRACT

The Base Registers in Finland are national information systems that identify the basic units of society. These basic units include persons, corporations, buildings and real estate. The Base Registers contain information concerning these basic units, information that is of vital importance to individuals and to society at large. Each register describes the state of the basic unit, as well as events which may have caused this state to change. Characteristics of the Base Registers include broad coverage, reliability, versatility and data protection. Another characteristic is that they have been prescribed by law.

Persons and corporations are linked to buildings by identifiers, as are buildings to real estate units. These integration possibilities provide an opportunity to use data in many combinations. One demonstration of possible applications is the census. From 1985 onwards, censuses have been carried out by the Base Registers without any data collection using forms. It is possible to use up-to-date data from the Base Registers at all times. Because all persons and corporations have been linked to buildings that have coordinates, it is possible to do very detailed spatial analyses of socioeconomic data. The analyses can be made without being based on administrative area divisions.

The role of the is fundamental for the integration of Base Register data. The identifiers for buildings, dwellings and places of business are derived from the real estate unit identifier. The Cadastre also provides data on administrative divisions.

The information systems of the Base Registers have been renewed over the last few years. The second generation of the Cadastre is now under construction. The work includes widening of the data contents with a spatial description of cadastral units. The construction provides improved possibilities to integrate cadastral and other Base Register data with geographical data.

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1. . DEFINITION OF BASE REGISTERS

The Base Registers are national information systems that identify the basic units of society. These basic units include persons, enterprises, corporations, buildings and real estate. The Base Registers contain information on these units and the relationships between them. This information is of vital importance to individuals and to society at large. Each register describes the state of the basic unit, as well as the events that may have caused this state to change.

The characteristics of the Base Registers include broad coverage, reliability, versatility and data protection. Another characteristic is that they have been prescribed by law or statute.

Broad coverage and reliability are quality aspects of the Base Registers. Broad coverage means that all basic units in accordance with the criteria are entered in the register and given an official identifier. Reliability results from the authorities' responsibility to maintain the Base Registers. The data is usually collected from those being registered, from their representatives, or from the appropriate authorities, and is subject to a corrective procedure.

Versatility and data protection relate to the rationality of the systems. According to the principle of versatility, all data should be collected only once, after which it can be used via the information service by other authorities and by those who need the information. Data protection means that data access and delivery are strictly regulated.

The Base Registers defined by the above criteria consist of the Personal Information System, the Business Information System, the Land Information System, and the Building and Dwelling Information System. The Business Information System is comprised of the Business Register (Trade Register), the Enterprise Mortgage Register, the Register of Enterprise and Establishments, the Association Register and the Foundation Register. The Land Information System is comprised of registers for the Cadastre and the Land Register.

2. IDENTIFIERS OF BASE REGISTER UNITS

Natural persons are given an official identifier. It consists of the birthday — six digits (ddmmyy) and a character indicating the birthday century (1800 '+', 1900 '–' and 2000 'A') — plus three surrogate digits and a control character. The identifier contains information about the person's birthday and is not orthodox according to theory. This is quite harmless, however, because the birthday does not change.

Enterprises and other corporations have identifiers eight digits long. These identifiers do not contain any additional information.

Real estate unit identifiers are formed by four fields of digits. The first field (three digits) indicates the municipality, the next two fields (three digits and four digits, respectively) indicate village or district block and house group or city block, and the last (four digits) indicates the number of the real estate unit. The Real Estate Unit Identifier (REUI) thus has the following structure:

REUI = XXX – XXX – XXXX - XXXX

The identifier contains a large amount of information and, more problematically, that data can often be changed.

Building identifiers are derived from REUIs as follows:

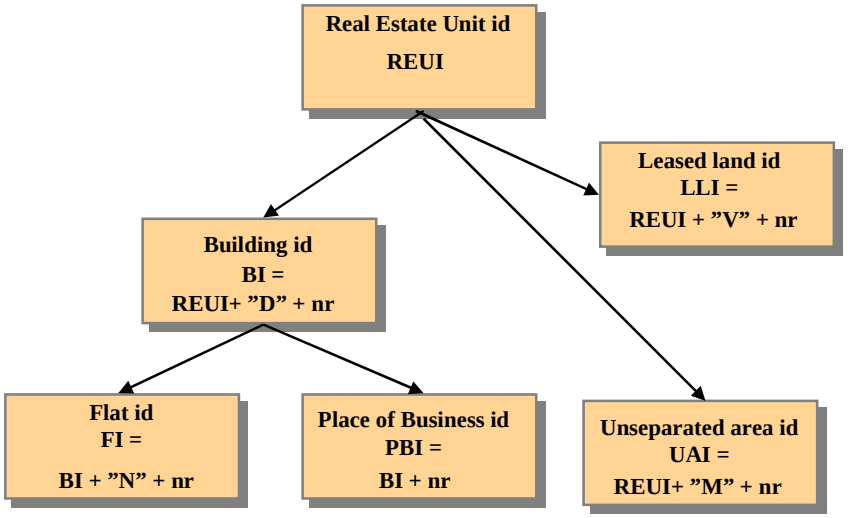
Building id (BI) = REUI + "D" + nr

Identifiers of flats are derived from BIs as follows:

Flat id (FI) = BI + "N" + nr

Also, identifiers for places of business are derived from BIs as follows:

Place of business id (PBI) = BI + nr



Identifiers for unseparated areas and leased land are formed according to the same schema. The figure below describes the hierarchy.

Figure 1

The reason for choosing this kind of identifier system has its roots in the early computerization history of the Base Registers. In those days hardware and its capacity were very limited. By combining information into identifiers, storage capacity could be increased . The integration of real estate, buildings, flats and businesses is simple because each unit's

identifier indicates the next highest unit in the hierarchy. The identifier also indicates the relationship of the units to the administrative divisions, such as belonging to the municipality, etc.

This solution has its drawbacks, which are encountered in the maintenance of the data. When a unit identifier located higher in the hierarchy changes, all identifiers below it must be changed as well. Such changes are not rare. Changes in municipality division cause many subsequent alterations. Cadastral division changes cause many further changes in REUIs, etc. These changes are not as severe for Base Register authorities because they have to make the corresponding alterations in every case, if not to the identifiers then to some other related data fields. The most severe drawbacks are encountered in other data systems where data concerning these Base Register units are stored. These systems must be able to update the BI, for example, and must know the former identifications of the building in question.

3. COMPUTERISATION OF THE BASE REGISTERS

Computerization of the Base Registers started in the early 1970s with the computerization of registers for persons, buildings and dwellings. In the late 1970s the National Land Survey of Finland (NLS) also began computerizing its cadastre, and some years later the largest cities started doing the same with their own cadastres[1]. The computerization of registers for business information also began in the 1970s.

The building of a national Land Information System (LIS) commenced in 1985. It consisted of both cadastral and Land Register components. Computerization of the entire country required a considerable amount of time and was finally completed in 1998. So far, the LIS does not include map (geometric) data.

Since computerization of the Base Registers took place decades ago, the registers have more recently been in need of renovation. Most now have their second-generation systems in place

4. INTERCONNECTION OF BASE REGISTER DATA

The Personal Information System contains an FI which indicates a person's permanent residence. This includes direct the identifier of the respective building and real estate. The REUI indicates the administrative divisions to which the residence belongs. Integration of these units is straightforward when the identifiers of the units are updated accordingly.

The register of Enterprises and Establishments unfortunately does not include data concerning places of business. Integration of businesses with buildings and real estate can be

[1] In this context the responsibility between different authorities for land administration in Finland should be noted. The NLS is responsible for the cadastre in rural areas, approximately 98% of Finland's total area, while cities are responsible for their own territory, roughly 2%. The numbers of register units are 2.2 million and 0.34 million respectively. Responsibility for the Land Register rests with the Ministry of Justice, and local courts update the Land Register.

achieved by using addresses of their locals. The system also includes identifiers of persons belonging to an enterprise or corporation's management and their management role.

The figure below describes the connection possibilities.

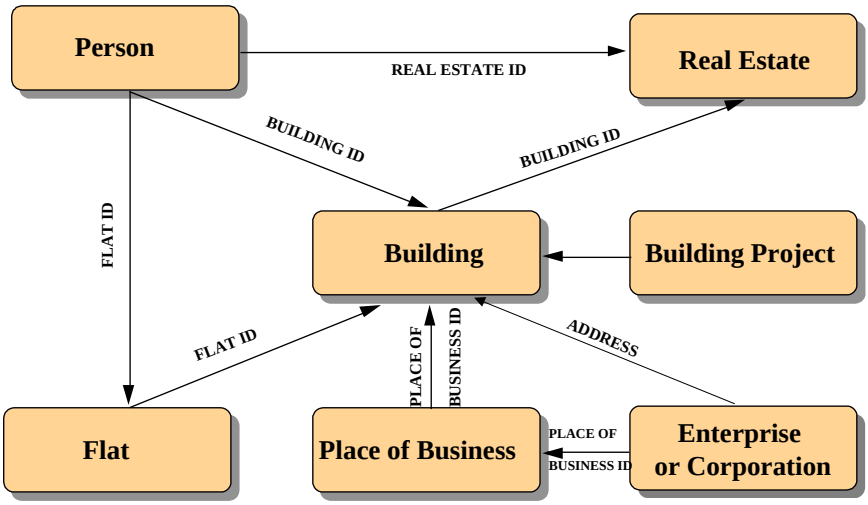


Figure 2

5. APPLICATIONS OF INTERCONNECTION

The largest application of the interconnection between the Base Registers is evident in census taking. Here there is no need to collect data through the use of forms; all data is available in the registers. The year 1980 was the last time a census was carried out entirely by form-based data collection. The need has declined thereafter. In 1985 census data on workplaces was collected only. Since that time censuses were conducted by register-based data collection. In addition, the cost of a census has dropped dramatically. The form-based census cost approximately 35 million euros. When carried out by registers the cost falls under one million euros. The reduction in cost and the continuously updated data have led to a situation where census taking can be done annually. It is still possible to collect and integrate data from up-to-date registers *ad hoc* for any date.

When connecting data from several registers, the required data must be collected and then integrated with some application. To avoid these cumbersome phases, the Population Register Centre has produced the Population Information System for information service needs. The most important data from the Base Registers are integrated into this system which contains the entire data contents of the Population Register and the Building and Dwelling Register, and some of the most essential data concerning real estate and places of business.

6. INTEGRATION OF BASE REGISTERS WITH OTHER REGISTERS

The Base Registers use official identifiers for the basic units (natural persons, juridical persons, real estate, buildings, dwellings, places of business). These identifiers are used in other applications as well. Integration using these identifiers is straightforward: coordinates can be given to natural or juridical persons using relevant building coordinates and data relating to these persons can then be integrated with geographical data. The figure below describes the integration possibilities

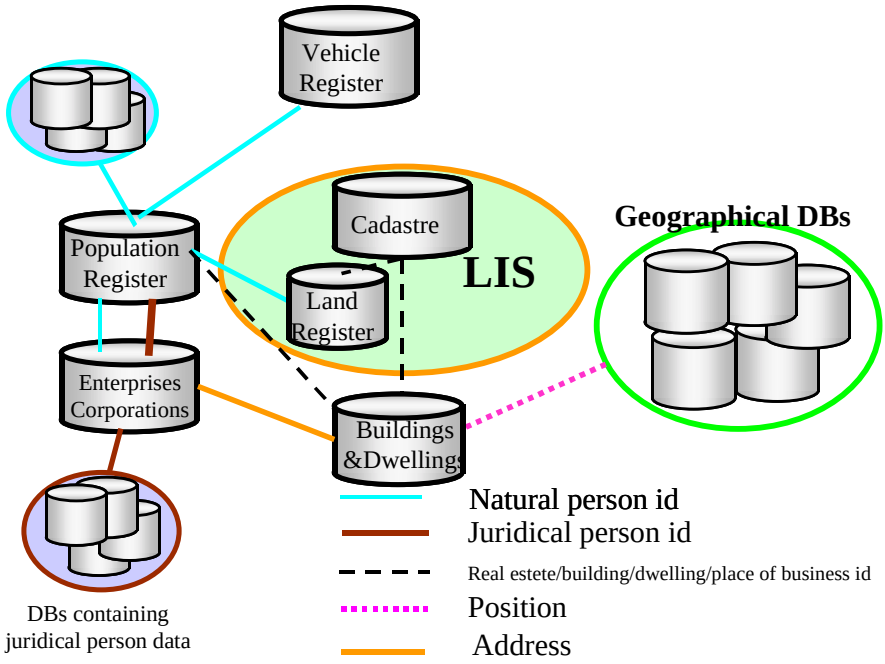


Figure 3

7. DEVELOPMENT OF THE LIS AND ITS SERVICES

A start towards establishing computer-based systems was made in the early 1970s, and over the last few years the systems have been constructed. All systems except the LIS have been implemented on a new computer and software platform. Rebuilding the LIS is ongoing, and will be realized in several steps over a long period of time. The LIS is divided into logical components but with few interconnections. The cadastre component describes real estate units and their interconnections. The Land Register describes interests of persons (natural and juridical) to the units in the cadastre.

The cadastre at the national level has so far not described the spatial dimensions of real estate units. The NLS has collected this data in digital form from the areas it is responsible for, about 98% of the country. Towns are responsible for the cadastre within their own jurisdictions. This area (roughly 2% of the country) is almost entirely mapped digitally.

The rebuilding of the LIS is currently focused on its cadastre component. According to plans this part should be in operation in 2003. Loading of the map data can then begin and new services based on use of a map interface can be incorporated. According to legislation, digital map must be part of the cadastre for the whole of Finland by June 1, 2005.

Land-use rights and restrictions have thus far been minimally described in the cadastre. Real estate units indicate which decisions concern them, but not the actual contents of these decisions; these data must be collected from other sources. When spatial description of real estate units (parcels) has been realized, and land-use rights and restrictions are also described as spatial objects, their relationships can be determined with GIS technology. In this regard, preparatory investments have been made and development decisions will be taken in the very near future.

By widening the data contents of the cadastre with the spatial description and by depicting land-use rights and restrictions as spatial objects, the feasibilities of making spatial analysis and of integrating geographical databases are considerably improved. The figure below describes the planned situation.

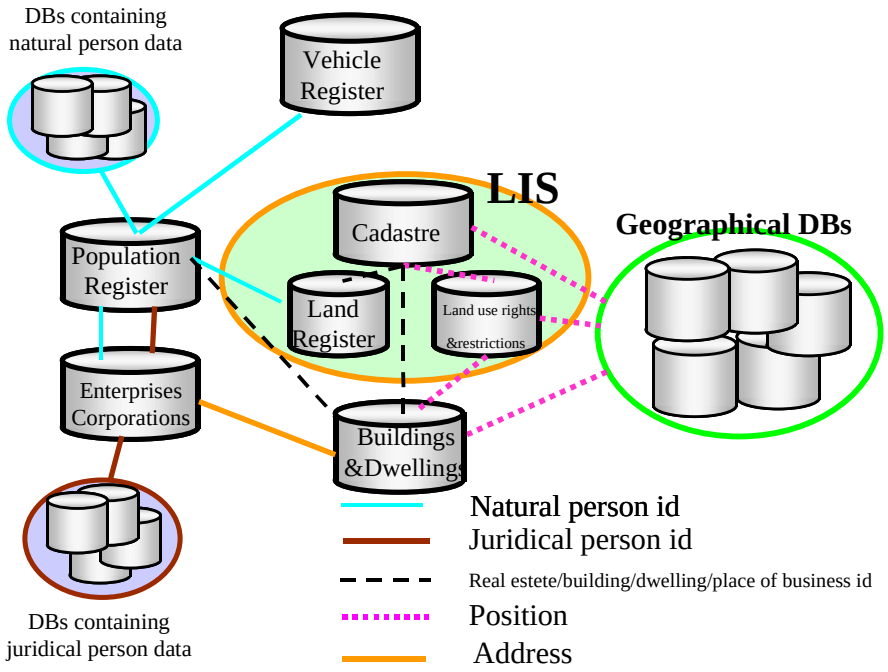


Figure 4

Defining a BI for a new house requires data on the building's location, i.e. relevant real estate. So far, without up-to-date information about cadastral division this identifier definition has been an error-prone operation and the errors have caused integration with other Base Register objects to be flawed. By adding the BIs and their coordinates into the cadastre it is possible to provide municipal building inspectors with a web-based application where up-to-date cadastral division can be visualized. By pinpointing the position of the new building on screen or by coordinates, the system assigns the identifier to the new building. With this

application the inspector or his/her staff can record the technical data of the building and its individual dwellings in the Register of Buildings and Dwellings.

With the exception of the above-mentioned operations, BIs and other identifiers generated from the BI must be changed when cadastral identifiers are changed. This occurs in legal surveys and by altering administrative divisions; in both operations cadastral units often change their identifiers.

The Base Registers provide a wide selection of services when their data and services are connected. Thus far, the connection of data has been possible only by batch processing, when the data and services provided by the Population Register Centre and the Population Information System are insufficient. A project is underway where interfaces for Base Registers are being built. This provides an opportunity to obtain and integrate Base Register data *ad hoc*. The figure below describes the process.

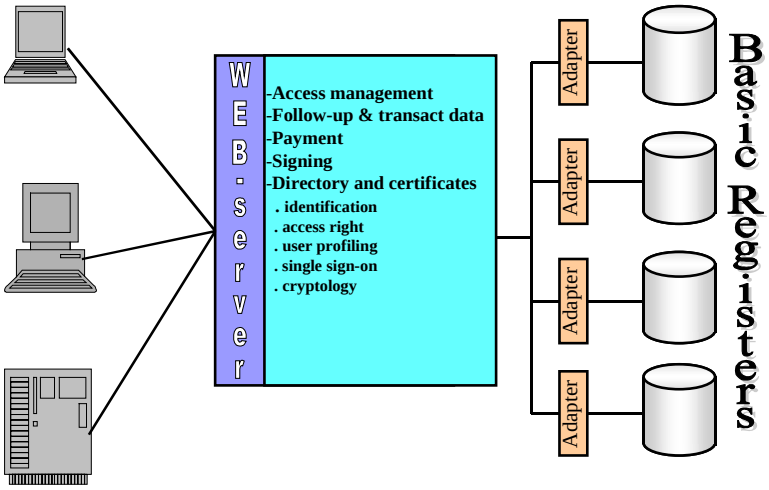


Figure 5

The concept provides possibilities for developing services in which data from several registers are needed. Such services can be centralized, with licensing, data protection, invoicing etc. managed without duplication. Data protection is a very serious issue in this environment. The Base Registers contain data relating to persons, the use of which requires permission from the relevant register controller. Combining data from several registers becomes more of a threat, from the individual's point of view. Although this paper has highlighted various uses of Base Register data, the requirements of data protection set strict rules for this use. Data protection is a fundamental principle of the Base Registers.

8. THE ROLE OF BASE REGISTERS IN INFORMATION SOCIETY

The Base Registers provide a sound basis for public sector administration. It is not necessary to organize data collection and registration in several organisations simultaneously. Data quality is guaranteed by the relevant administration sector responsible for these data. One of the best examples of data usage is the census, where it is always possible to access 'census

data' from any date. The Base Registers are of vital importance for research in many fields, from energy use to genetic research.

The private sector benefits enormously from the Base Registers. Reliable data concerning real estate and rights therein and data on enterprises and corporations provide a reliable basis for secure business. Large customer registers can be updated by using population registers, and logistic applications can use data from the Base Registers. One important application is direct mail advertising.

Analysing possibilities are available regarding the basic units of society. Data from the Base Registers can be integrated with many other registers by using standardized identifiers. Spatial analysing possibilities are already at hand and will be promoted when spatial description cadastral units are available nationwide in 2005. The spatial location of all Base Register units allows for the integration of these data with all other geographical data. These possibilities plus reliable data are efficient fuel for the information society.

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