

LITHUANIA 2000: STRATEGY FOR LITHUANIAN NATIONAL INFORMATION INFRASTRUCTURE – APPROACH AND SPECIFIC FEATURES

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Abstract. In this paper we present the development of the nationwide information infrastructure in Lithuania. The paper describes the general framework of Lithuania's information infrastructure, basic philosophy behind it, and the current solution of the problem from the point of view registers, data network, standards and application systems.

Key words: information infrastructure, distributed systems, strategic planning.

1. Introduction. In 1994 The Republic of Lithuania has determined to begin the development of modern nationwide information infrastructure serving all levels of government as well as other appropriate public and private institutions. This program will be known as LITHUANIA 2000.

The primary objective of this paper is to give the outline of the program LITHUANIA 2000 and its specific features. We discuss the state of the art of LITHUANIA 2000 as well as the plans and problems.

It encompasses the development of a data network, nationwide registers and data bases, the facilitation of various state regulatory mechanisms such as taxes and customs, and the development and establishment of standards consistent with the goals of the program.

The mission of LITHUANIA 2000 is "to facilitate Lithuania's con-

version to a market economy, it's integration into the European economic system and today democratic family of nations" (Statement of Work "Lithuania 2000", 1993). For this to be done the entities that regulate the flows of products, raw materials, capital, people, and information are to be computerized, the European standards for contractual procedures, accounting, documentation, and other elements of industrial and business activities are to be established, an integrated government management information system are to be created, modern strategic planning, decision making, and management procedures are to be developed, procedures to serve citizens, companies and other clients are to be systematized, optimized and computerized, a nationwide system of computerized registers, cadasters, administrative data bases and legal data bases are to be created, and public telecommunication system must be designed and implemented, i.e., a modern integrated nationwide information infrastructure are to be built.

The nationwide information infrastructure is regarded in LITHUANIA 2000 as the cooperation of DP activities on the state, regional and municipal administration levels and is focused on traditional administrative environments. The integration will focus on functional areas of government. The information infrastructure must include a number of computerized administrative and statistical registers, cadasters, and a number of transaction processing systems and information systems which have to communicate via a computer-aided network and are based on the use of numerous technical, information and other standards. As far as it is possible the data must be gathered and recorded only once, then it is to be used for number of different applications. For this to be done, ways, means and standards for classification, identification, codification, legislation and transfer of data must be developed (Chevion, 1983). The range of applications varies from fundamental office functions such as accounting, word processing and mailing, through to specialized areas such as budgeting, statistical analysis or roads planning. The applications must be integrated (as in RACE project (Callighan and Turner, 1993)) by providing a common, open, distributed processing platform that would mask the complexities inherent in distributing data in using heterogeneous hard-

ware. The uniform user interfaces should be designed. Access to all personal, organizational and external information and computing resources the user requires should be made available at each user's workstation.

2. Philosophy. The basic philosophy behind the LITHUANIA 2000 program is not original and is influenced by "The impact of new technologies on information systems in public administration in the 80s" (1983), Chevion (1976), Aurbakken (1993) and other similar ideas. It can be briefly described as follows:

1. The information resources are no less valuable things as energy, raw materials or other resources. The data about people, roads, buildings, rivers and other real objects must be collected, classified, coded and recorded in registers, cadasters or other data bases. The data should be collected at the some location, where it is generated. As far as it is possible, any data item must be gathered and recorded only once.

2. The public registers, cadasters, and data bases are to be used by the all important nationwide applications, such as taxes, social security or customs. Those applications have to be integrated on two different levels, on the level of governmental administration and on the level of municipal administration. As far as it is possible, the application data bases for taxes, citizens, social security, etc., must be distributed among the regions. Interconnection of these de-centralized data bases are to be proved by the public computer communications network. The distributed databases must be designed so as to reflect local information in order to support the transfer of power to the local administration. On the municipal level the application systems must generate the aggregated information to support municipal decisions, and on the governmental level – the aggregated information to support decisions which are made by the President, Government or Parliament. As a consequence of the distributed system architecture, computer power should be distributed as well, using small to medium size mini-computers.

3. The state information infrastructure should be designed to be independent of the current organizational structure of the public administration as far as possible. It means that the functional activities independently of organizational structure must be identified and implemented as national

transaction processing systems which should not be intermixed with the information systems of agencies. Information systems should be regarded as upper level systems which make use of data prepared by the national transaction processing systems.

4. Good planning is the key to the effective information systems use and development. However, the complexity of LITHUANIA 2000 is too big to design the whole information infrastructure as one coherent project. The applications will be integrated by providing a common, open, distributed processing platform that would mask the complexities inherent in distributing data in using heterogeneous hardware and must be built up by means of the numerous standards for classification, identification, codification, legislation, processing and transfer of data. The standardization must be based on multi-vendor standards and, consequently, secure competition between a multitude of vendors.

5. The backbone of the whole national infrastructure will be computer network. It is to be built over Lithuania's data transfer network and must provide interoperability of numerous different application systems. In the program LITHUANIA 2000 the development of the modern computer network has to be regarded as the task with the highest priority.

6. The technological changes should take part gradually and sufficient time should be allocated to allow for the training in the new technologies and for the user's adaptation. The implementation of the new technologies should use where to minimize expenditures.

7. Computer-based information systems do not offer a panacea for all illness. The IT area is just one part of the overall development concern for the country. However, the advanced technology must be used in an aggressive way for the building up of information infrastructure in society and the improving of the efficiency public services. On the basis of the new information infrastructure new administrative processes must be established.

Legal, ethical and technical safeguards to prevent information from dropping to unauthorized persons and protection of privacy and competition play the important role in LITHUANIA 2000, too, but in this paper we shall not discuss these issues.

3. Registers and digital maps. Lithuanian register and cadaster system should be a system for a collection and updating of important basic information on objects, relations, activities, tools and events by responsible registration authority. Registration should be a continuous process. An alternation in a registered item of information must be entered in the registers and cadasters as soon as possible. The register and cadaster system must serve for the administrative authorities in the whole public sector as well as for statistical and research purposes and to a large extent for a business. The information on registered items should be presented on a map and connected with other numerical data on the basis of coordinates of appropriate entities. The information should be offered customers in a machine-readable form, on paper or by the telephone. Customers who regularly need information in their activities should be given the right to direct-access. Data protection should be secured by limiting the access to information except is really necessary to customer.

One of the basic principles of the Lithuanian register and cadaster system is that, as far as possible, no one should personally notify the authorities of the information about entities to be registered. Instead, information should be sent directly to the registration authorities from other official bodies, which fix various events, such as births, transactions, etc. In this way not only the public registers but also the customers' ones should be updated. This principle is adopted from the registration systems in Sweden (Population Registration in Sweden, 1988), Norway (Aurbakken, 1993), Finland (Population Information System in Finland, 1993) and Denmark (Jansen, 1983). The connection between the data items in various registers, cadasters, data bases, information systems and other application systems must be created by using nationwide identification cards. All data items and codes will be defined and accepted as standards to be used generally in the whole public administration. What is important, the system must be based on open system standards, a client-server paradigm and common classifications. In this way the information can be automatically transferred via public data transfer network from one system to the other.

At the present more than 50 classificators, cadastrics and registers are

under development. The most important of them are the population register, legal units register, land cadaster, forest cadaster, road cadaster, cultural heritage register, buildings cadaster, workplace register, and cadaster of natural resources.

Currently, only few institutions are working with digital mapping and GIS in Lithuania. Digital mapping is usually done by GIS center, chaired by the State geodesy agency. In 1993 GIS center produced digital map which was digitized from maps sheets scale of 1:200 000. The GIS center in cooperation with Satellitbild company (Sweden) presently prepares the digital map scale of 1:50 000, which is intended to be a background for administrative and planning systems. To our opinion, the general GIS design strategy should be similar to a strategy proposed in (Daugbjerg, 1990). The information systems should be designed for multiple purposes rather than for specific projects. Those systems should be based on data extracted from the basic registers. The integration of the digital maps and Lithuanian register and cadaster system should be organized through implementation of crossference concept described in (Daugbjerg, 1990). It means that those physical entities, their identifiers and their goecodes, which together form the basic index structure in a communication model between registers and maps, must be pointed out.

4. Network. The public computer network will assure the interoperability of all subsystems of Lithuanian information infrastructure. The network will be based on the Lithuanian data communication system. The data communication system should be developed in full to 2005. First branches of the network should be put in operation in 1994.

The subsystems of the computer network can have internal, perhaps even a hierarchy of, computer networks. By the internal network we mean independently administrated networks that have internal operation rules. The public computer network should connect all these private networks. The connection should be made by keeping with the European commission's' recommendations. It means that the private network should be connected to the public network via telecommunication node. It would protect the data from unauthorized users and control the flow of information between public and private domain.

One should distinguish among the internal resources of the private networks and the global resources of the public networks. The services provided by the public network should be implemented in accordance with the client-server paradigm. From the functional point of view the basic nationwide computer network elements are to be the following:

- (a) regional networks (Metropolitan area or Wide area networks) which should have their own telecommunication node for link to the public network,
- (b) LAN's which must have their own telecommunication node for link to the public network,
- (c) registers, cadasters and other public data bases accessed via the network and implemented as servers,
- (d) data communication network.

Together with the network regular routines there should be established procedures to facilitate the connection of the users. The connection will be regulated by the data protection and security standards and the billing system for the services rendered.

At this stage of the project, we intend to adopt computer network architecture described in (Buvang, 1990). The different types of application systems should be clients to servers of different kind. Powerful file servers, mail servers, compute servers, X-servers and data base servers should be provided. The server machines should be RISC-based machines. The project to produce RISC-based POWER PC computers in Lithuania has started in August, 1993.

5. Standards. The integration of the different computerized administrative systems in LITHUANIA 2000 must be achieved by means of numerous standards. Those standards will:

- (a) standardize the architecture and behavior of public data bases including, but not limited, to the registers, cadasters and classifiers,
- (b) provide the uniform identification of the information items and basic attributes,
- (c) provide the integration of the registers, cadasters and classifiers with digital maps and the bar code system,

- (d) establish formats for the data and document interchange,
- (e) provide the integration of applications on the basis of a common, open, distributed processing platform that would mask the complexities inherent in distributing data in using heterogeneous hardware,
- (f) provide the data protection and security,
- (g) establish the uniform user interface.

The Lithuanian information infrastructure standards system must be, as far as possible, based on the OSI standards and recommendations of European commission. The standardization must be based on multi-vendor standards and secure competition between a multitude of vendors.

6. Municipal systems. The great amount of data is collected in cities and regions. Most central agencies (taxes, social security, etc.) have their representatives on the regional level. Those representatives register local events and collect data for central databases. According to our conception, the workplaces of all local registrators must be collected via LAN and be regarded as subsystems of the municipal system. At the same time they should be subsystems of the appropriate distributed central systems which must be integrated into the national system in the same way as its elements on the local level are, but by the means of public data transfer network. Decision support system for the local government must be built on the basis of the municipal system, and the decision support systems of the central government, parliament and other central institutions must be built on the basis of and upon the national system. To our opinion, the municipal systems should be regarded as the lowest, fundamental level of the whole national information infrastructure.

7. Types of application. We distinguish four kinds of application systems:

- registers, cadasters and other information suppliers,
- nationwide transaction processing systems (NTPS),
- information systems and office systems of agencies,
- national decision support systems (NDSS).

NTPS's support the general activities which are essential for every state.

Currently, we have identified 29 most important activities: elections, people protection, security and justice, legislation, defense, boundary crossing control, customs, property protection, budgeting, taxes, insurance, banking, social security, privatization, prices, labor market, demography, health care, education, cultural heritage protection, development of regions and cities, management of public property, management of natural resources, landscape protection, environment protection, energetics, transport, communications, and post. In NTPS the data is organized according rather to its use for single purpose, but not according to the object, which they describe. This data is usually of interest only to several agencies, and are of interest to other agencies only to a very limited extent. According to our philosophy the NTPS's should be separated from the information and office systems of agencies. They should be independent from the current organizational structure which can be changed. Some activities (for example, banking, social security, health care, education, energetics, transport communications, post) can not be supported by single NTPS (even distributed) and require for its support clusters of the systems of different types and the databases. Such clusters form branch information infrastructures (BII). Most NTPS and BII should be closely connected with the municipal systems both methodically and technically. It means that they should be implemented as distributed systems.

To our opinion, the information system of agency should be based on one or several NTPS. It must be designed to contain all the aspects of the activities of some concrete agency and to provide sensible and timely information to support necessary decisions. Also, the information system must create workplaces with desktop applications for employees. It must be implemented upon LAN and support the team work of the employees in the network. We regard the office automation system as the inherent part of the information system.

The NTPS is based on a large but limited number of information sources. Nevertheless, the government requires information which should be collected from as many NTPS and BII as possible. It may then require the development of the upper level systems, NDSS. Examples of such systems are statistical systems or government decisions support systems.

8. Strategical goals. After careful consideration of local conditions, historically formed understanding of the role of a state in the society, and mentality of the people the highest priority, to our opinion, should be attributed to the following basic systems in the national information infrastructure:

1. National data communication network.
2. Integrated system of state registers, cadastrics and classifiers.
3. System for collection, analization and dissemination of legislative acts and official governmental documents.
4. System of digital maps and geographical information systems for Lithuania.
5. National accountancy and statistics system.
6. System for development and production in Lithuania modern RISC PowerPC processor architecture computers, workstations and application software.

On the next level of priorities are the following systems:

1. The family of prototype information and management systems for municipalities and self governments.
2. Taxation budgeting system.
3. Information infrastructure for banks.

Above mentioned objectives established in the Lithuanian national information infrastructure strategy reflect specifics of the notion of the national information infrastructure. In Lithuanian understanding, this notion concentrates on the development and support of state administrative system, and, in comparison with Western-style contents of national information infrastructure, includes extra parts and features. One of those specific features, concerning the goal to develop manufacturing of computer systems and application software in the country as one of the tasks in the framework of creation of national information infrastructure, will be discussed in more detail in the next paragraph.

9. Development of national IT industry. Creation of full-scale viable national information infrastructure is extremely expensive endeavour. To make it cheaper, it is very important to employ all the local resources and opportunities. In Lithuania one of such resources is many-years-long

tradition and experience in manufacturing computers and integrated circuits for exSSSR market (Lithuanian-made computers had about 3% of exSSSR market). Even in present situation, having to take into account that existing in the country manufacturing equipment and facilities are absolutely outdated and can no longer be useful, human education, experience and skills are not lost yet. Also, human links with the former partners from the East are still alive, and, because of new openness to the West, cooperation links with the Western IT partners are evolving very quickly. This is a background for the initiative to renew computer industry in Lithuania on the basis of the most recent computer technology from the West.

The choice of technology has been made in favour of new computer technology created jointly by the world computer industry leaders IBM, Motorola and Apple. The core of this technology is RISC PowerPC processor architecture and family of microprocessors.

Due to the initiative and efforts of Ministry of Communications and Informatics, Ministry of Trade and Industry, support from the Government, and with active involvement of several leading private and state-owned computer companies (specializing in trading Western made hardware and software, offering customer solutions for local clients, etc.) very positive and fruitful relations with IBM company had been established. Under concluded OEM contracts transfer of "know-how" and technical support, enabling to start manufacturing in Lithuania PowerPC architecture computer systems and software for this platform was granted.

Several gains and advantages for the task of creation of national information infrastructure can be achieved by this initiative:

1. State-of-the-art computers will be acquired by 15–20% cheaper than using usual trading channels.
2. Hard currency savings for the state.
3. Synergy from more intensive flow of modern IT technology into the country, spread of computer education, widened IT expertise, all resulting in higher demand of and more effective use of local human resources in IT and related areas, improved public image for the program LITHUANIA 2000, prevention of "brain-

drain" and better choice of specialists for national information infrastructure and other IT tasks.

4. Opened possibility to export computer systems and application software, providing payback of spent money which can be used to intensify creation of Lithuanian national information infrastructure.

10. Conclusion. The mission of LITHUANIA 2000 is to facilitate Lithuanian's conversion to a market economy, its integration into the European economic system and today democratic family of nation by creating nationwide integrated information infrastructure. Approach to this task, being in many aspects similar to that of the countries with historically longer democracy and market economy tradition, is based on an enwidened understanding of national information infrastructure. In Lithuanian adaptation, this notion concentrates on the development and support of a state administrative system and includes specific extra parts and features. One of those features concerns the strategical goal to develop manufacturing of advanced computer systems and application software in the country by transferring required technology from the West.

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