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Information System for Veterinary and Sanitary Control[1]

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Abstract: *Following an analysis of the information flows a computer and communication infrastructure of an information system for a veterinary and sanitary control is introduced. It is based on the usage of the national communication network for data transmissions and also on an Internet-environment for an information interchange between different components of the information system. The choice is determined by the modular distribution of the processings between remote and centralized resources of the integrated information system and also by the possibility for an easy integration with international organizations.*

Keywords: *information interactions, software architecture, computer and communication infrastructure.*

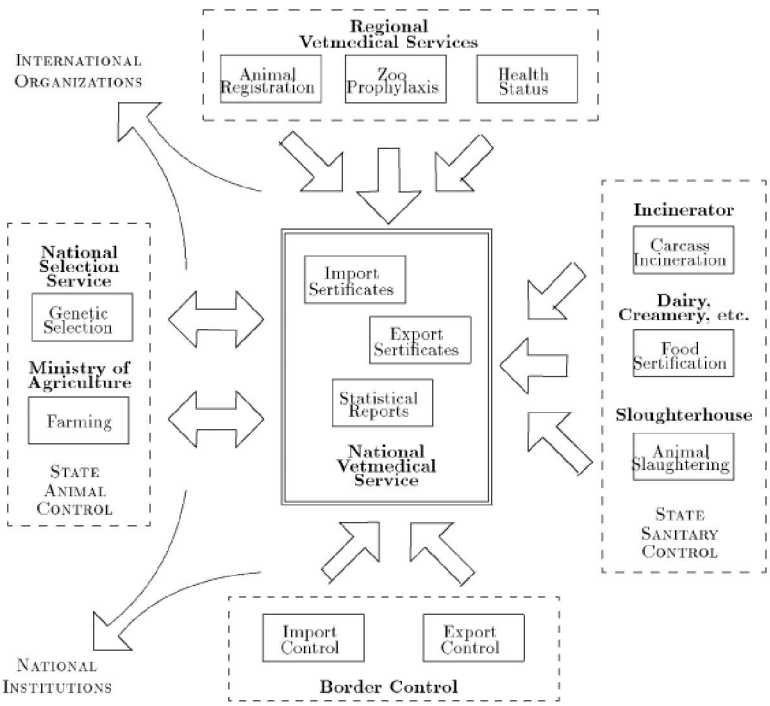

Fig. 1

According to the conclusions and the regulations of the experts and the consultants from the European Union (EU) and also as a direct corollary from the very dynamics of the privatization and integration processes in the agricultural sector in Bulgaria during the last years, the creation of a national information system for a veterinary and sanitary control may be treated as a priority for Bulgaria.

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The Fig. 1 introduces the most common structure of the activities which are controlled by the National Veterinary and Medical Service.

Functional specification of the information system

The main possibilities of the information system for a veterinary and sanitary control must cover the following procedures:

- registration and monitoring the movement of individual animals and flocks;
- profilactics and its regional sanitary actions;
- treatment of the ill animals and flocks and control of the epidemiological situation along the territory of the country;
- neutralizing the consequences from the distribution of different illnesses;
- publishing licences and control of the import and the export for the trade with living animals and agricultural products;
- generalization of the statistical data and its sending out to the concrete users of the information.

Structure of the information interaction

The analysis of the information flows of the present active system for a vetmedical and sanitary control in Bulgaria outlines a natural architecture of the information system of a hierarchical-centralized type.

Primary sources of information: Station Vetmedical Services (several hundred), Veterinary Hospitals (about 107), Individual Farmers and Farms, Merchants and Hauliers of the state or of a private type.

Intermediate concentrators: Regional Vetmedical Services in the territories of the ex-districts (28 offices), Border Custom Offices (14 offices), State Sanitary Control Service, Slaughterhouses and Creameries included.

Users of vetmedical information: International Health and Veterinary Organizations, National Statistical Institute, Ministry Council, State and Private Producers, Merchants and Hauliers of an agricultural production.

Information processing, distribution and recording is naturally done by the National Vetmedical Service in a direct collaboration with equal rights with the State Sanitary Control Service which is coordinated by the Departments of Stock-cattle-breeding and Veterinary Medicine belonging to the Ministry of Agriculture, Forestry and Land Reform.

Necessary computer and communication infrastructure

The national information system for a veterinary and sanitary control must conform first of all with the european traditions and the last tendencies in the legislative policy. Most of the west-european countries already have their own information systems for monitoring the traffic of the agricultural animals and of a control of the sanitary-epidemiologic situation. The last tendencies point to the implementation in the EU countries

of a united unified information system which will allow a reliable control over the traffic of the agricultural production with respect to the whole union, not only in the individual member-countries. The most important elaborations with this regard are those concerning the european projects CAPT (for monitoring the traffic of the agricultural animals by the combination of telemetric and descriptive data) and EUROVET (for identification and monitoring the state of the vetmedical situation) which outline as a basis for a standartization in the information service of the stock-cattle-breeding in the EU.

The analysis of the accumulated by now experience and the performed prelude of the National Vetmedical Service and the Ministry of Agriculture and taking into account the experience of the specialists in the Institute for Information Technologies in the Bulgarian Academy of Sciences which concern the elaborations and the implementation of the information systems – all this makes the authors' collective estimate that all the necessary prerequisites are present and that it is possible with the efforts of bulgarian specialists to elaborate and to implement an information system for a centralized control of the vetmedical situation in the country.

Based on the contents and the characteristics of the information flows and taking into account the modern state of the means for elaboration of information systems which can satisfy the requirements about the reliability and the control of the regional information and its traffic towards the National Vetmedical Control (NVMC) with minimal expenses, the most expedient scheme is the generalized one of the computer and communication infrastructure of the information system of the National Vetmedical Service which is based on the usage of the national communication network for data transfers.

The basic technical components of this system are the following:

Information server of the central data base: System for maintenance of relational data bases with a local access to a "client-server" architecture with a SQL-protocol; it accumulates, stores and registrates the data from the regional clients in the regional vetmedical services, the border custom offices and the central reference and statistical services. It is in the very National Vetmedical Service.

Internal clients of the central data base: Specialized applications of the information system which operate in a mode of a direct SQL-access to the central data base in the local NVMC network; they do the centralized information processing, the preparation of statistical reports and references.

Communication server of the central data base: System for support of a remote access to the central data base from data through Internet; it ensures a Web-access to the HTTP-protocol of Internet and also it ensures the automatic input of data from the regional clients in the central data base through Internet and the output of references in the WWW-space of Internet. It is located in NVMC.

Information servers of the local data bases: Systems for maintenance of relational data bases in the regional vetmedical services; originally these servers may

operate in a mode of personal information systems with SQL-requests with a format which is the same as the one of the central server, with a possibility on the next stage to branch the information infrastructure of the integrated system to include also the primary information sources - the regional veterinary offices, the station vetmedical offices and individual ferms. They accumulate, store and registrate the incoming primary information on a regional level and also they prepare its transfer to the central server.

Regional clients of the local data bases: Specialized applications of the information system which operate in a mode of a remote access through Internet to the central data base; they send the regional information to the NVMS using universal means for a local preparation of the data and their traffic with a HTTP-protocol.

External clients of the central data base: Universal applications for a remote access to the published in Internet information from NVMS which function in the respective national institutions and the international organizations in a mode of a remote access through Internet; they realize a public access to a selected information from the central data base using a HTTP-protocol.

The choice of Internet as an unified communication medium for data exchange between the separate components of the national information system is dictated not only by the modular distribution of the processings between the remote resources and the centralized ones of the integrated information system, but also by the possibility for an easy integration with the international organizations.

The proposed technical architecture totally coincides with the accepted concept in the EuroVet project and this ensures additional favourable prerequisites for an easy integration. Besides the accepted concept is also the most commercial one due to the following factors:

– only public channels for information interchange are used; they can be easily realized and they do not require any special technical support;
– data bases are centralized which allows the centralized control, multiplication in the usage of the information and also the easiness of the support;
– only an universal software is installed in the clients' computers which are free of charge; they do not require special technical accessories except the possibility for an access to Internet and they require no technical support.

Architecture of the information system for a remote access to the data bases using Internet

The architecture of the information system is based on a triple-layer concept for "easy clients" and for an "application server" which operates in an immediate connection with the data base server

The realization of the information system for a remote control requires two software products:

– Oracle Database Server,

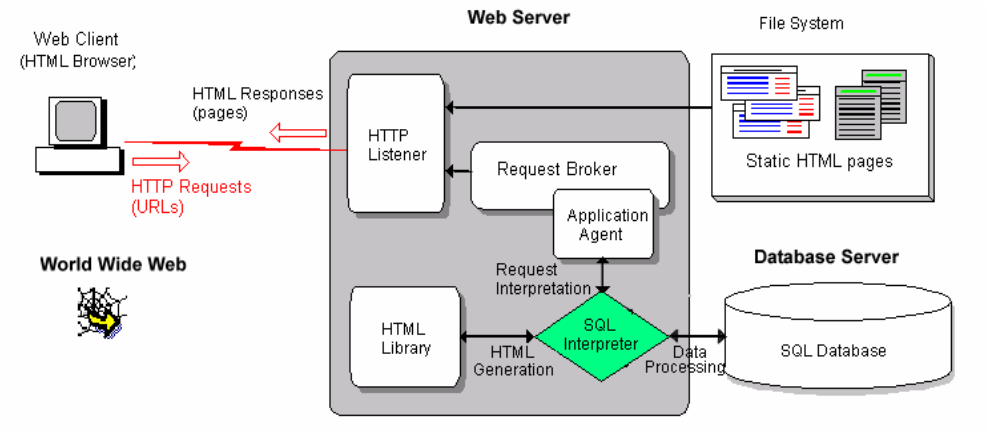


Fig. 2

– Oracle Application Server.

In this scheme the clients' computers require no specialized software except the standard and universal Web clients.

Technology of the elaboration

The elaboration process of the information systems for a remote access to data bases of the Oracle firm which is used in the prototyping is based on the concept of CASE-based generation of the data base and the application modules for a remote access by model specifications. This technology for a fast prototyping is elaborated during the last ten years by the Oracle firm and it enjoys an exclisive popularity for the elaboration of highly responsible industrial systems.

Software architecture

The software architecture includes the following components:

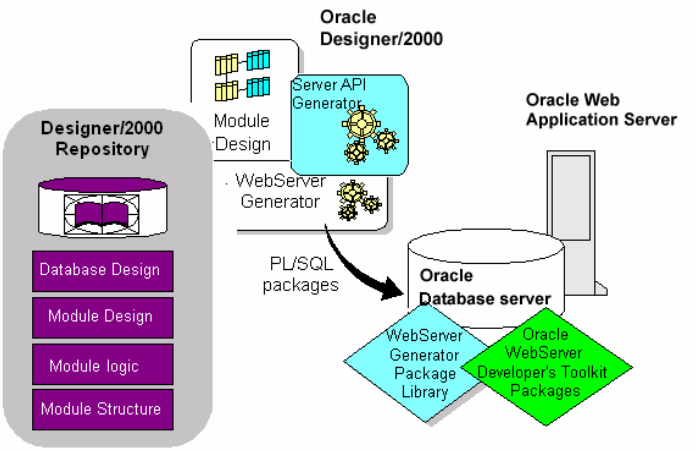


Fig. 3

– Database server,
– Server for design specifications (Design Repository server),
– Internet server (Web server),
– Application server,
– Designer clients,
– User clients.

The general scheme of the software architecture is illustrated in the Fig. 3.

The usage of a server for the designer specifications allows the simultaneous work of a designer team for several clients.

Application software for remote control to the data base

The application software consists of a kit of program packages and triggers of PL/SQL, each package corresponding to every table and six triggers for any operation with the data from all the tables.

All those software modules are generated automatically in the case of using design specifications of the data base with Oracle Designer (Fig. 4).

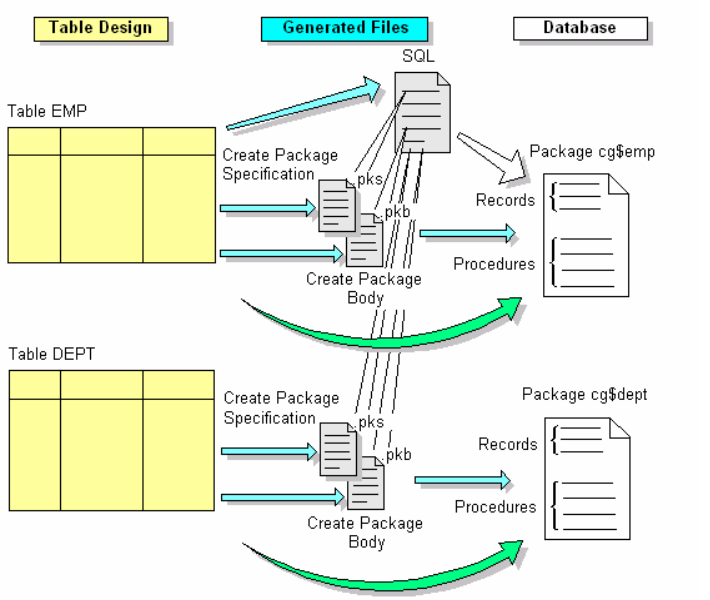


Fig. 4

Information system modules for an access to the data base through web

The modules which offer a possibility for a remote access to the data base are an ensemble of PL/SQL packages with a typical structure. Their logic follows directly the logic of the visual model and it is generated automatically from their visual presentation which is designed with Design Editor.

Once the application modules are generated they are installed from the name of

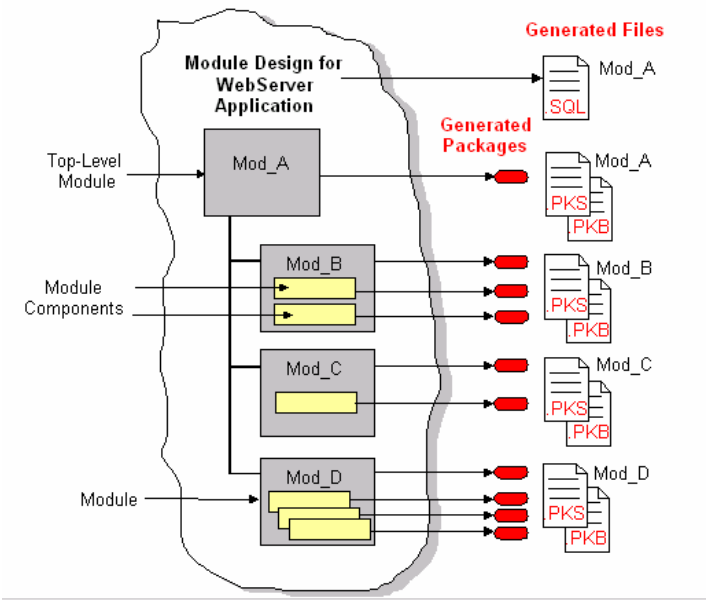


Fig. 5

the same user of the data base as it is in the case with the application software for a remote access.

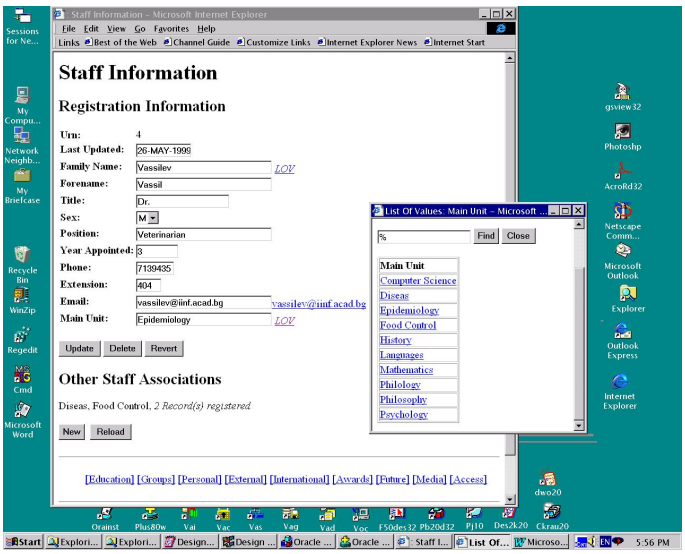
Methodology to construct the business model

The modeling of the business processes or of the *business diagrams* as its concrete product must describe in typical terms the operation of the organization / institution from the point of view of the information processes which take place in them and which must be automated by the concrete information system. This model is based on the schematic description of the interactive sessions of the system and the identification of the used information.

The separate business model components are identified with different operative *roles* in the office hierarchy of the organization / institution which is the object of the information system. The *user profile* which is a byproduct of the business diagram construction in the form of an ensemble of information interactions is in the base of the control system of the access to the information in the information system. The approach to the target especially uses the division of the information resources to common (which are accessible for different users in the system) and specific (which are accessible only for separate system users) modeling the function of the organization. On the other hand the business model serves as a functional specification of the *procedure modules* in the information system which will be used by different clients according to their functional characteristics.

Remote access to the data base using Internet

All procedures for user reception, sertificate requests, reception of the real import / export and publication of statistical reports for the veterinary and sanitary situation may be realized following an unified scheme:



– starting a standard Web client (MS Internet Explorer, Netscape Navigator, etc.)

– selection of the virtual address of the information system, e. g. **http://vetmed.agro.bg/vetmed/startup**

– following the indicative buttons and inscriptions to input the information or to receive it or to publish reports

Fig. 6

Fig. 6 depicts the reception page of the prototype which allows the input of information from any registered system user.

Conclusion

Based on the cited results the Institute for Information Technologies has elaborated a model of the information system with five stations. The experiments proved the efficiency of the system and the execution of the functions for which it is designed. The system documentation is delivered to the National Vetmedical Service for an approval and implementation along the territory of the country.

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Информационна система за ветеринарен и санитарен контрол

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(Р е з ю м е)

След направен анализ на информационните потоци е предложена компютърна и комуникационна инфраструктура на информационна система за ветеринарен и санитарен контрол. Тя се базира на използване на националната комуникационна мрежа за предаване на данни и Интернет-среда за обмен на информация между отделните компоненти на информационната система. Изборът се обуславя както от модулното разпределяне на обработките между отдалечените и централизираните ресурси на интегрираната информационна система, така и от възможността за лесно интегриране с международни организации.