New approaches to presenting information in the agrarian sector and country areas – Technological solution of the agris web portal

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Abstract

The present paper brings an overview of both technological and functional upgrade of the agrarian web portal AGRIS (http://www.agris.cz). Agris 4.0 version has been developed, tested and launched in the course of 2010. Agris 4.0 is built and runs on Microsoft technologies within the framework of MS IIS web server. Model-View-Controller (MVC) architectural pattern, an inherent part of the technology .NET framework 3.5, has been used.

Key words

WWW portal, web browser, AGRIS, agrarian portal, ASP.NET, MVC.

Anotace

Příspěvek prezentuje výsledky řešení technologické a funkční inovace agrárního WWW portálu AGRIS (http://www.agris.cz) – označena jako verze Agris 4.0, kterých bylo dosaženo v průběhu roku 2010 a které jsou postupně ověřovány a následně uváděny do reálného provozu. Agris 4.0 je postaven a provozován na technologiích Microsoft v prostředí WWW serveru MS IIS. Pro rozvoj portálu bylo použito architektury návrhového vzoru Model-View-Controller (MVC), který je součástí technologie .NET framework 3.5.

Klíčová slova

www portál, webový prohlížeč, AGRIS, agrární portál, ASP.NET, MVC.

Introduction

Nowadays information and knowledge society (economy) features a growing number of information resources from all spheres of human activity; these resources take various forms and have a different quality, relevance and availability. Not only is the number of these resources undergoing a dynamic change but as well their form and structure is. While talking about departmental information resources, the AGRIS portal **(http://www.agris.cz)** holds a very prominent position in the long term.

The agrarian web portal AGRIS is a unique on-line information resource not only for the agrarian sector (agriculture, food industry, forestry, water management) but as well for most regions and for the countryside in general. The target users are primarily company executives, state administration, local authorities, students, food consumers and rural areas inhabitants. The agrarian web portal AGRIS presents and provides access to the existing information resources, generates its own pieces of information and publishes information from the subjects that do not have but limited conditions for their own quality electronic presentation. Enhanced availability and applicability of the information presented constitute an important added value of the portal. Moreover, the academic environment offers maximum potential, guarantee of expertise and considerable independence.

The AGRIS portal has been providing its services since 1999. It was created and developed by the Department of Information Technologies FEM CULS in cooperation with the Information and Consulting Centre FEM and the Ministry of Agriculture of the Czech Republic. In 2000 it was awarded a prestigious Zlatý klas (Golden Spike) award at the international agricultural exhibition and fair Země Živitelka (Bread Basket) in České

Budějovice. Last substantial modification of the whole portal was carried out in mid-2003, i.e. more than six years ago. Further information on the general concept and solution of the fore-mentioned AGRIS portal version 3.0 can be found e.g. in [13], [14], eventually in [15].

The technological and functional upgrade was conditional for keeping qualitative and functional standards of the portal. The upgrade was realized in line with the most modern technologies, latest information resources development, current trends and requirements of the portal users.

The paper presents the upgrade outcomes that have been reached, step by step tested and subsequently launched in the course of 2010.

Objectives and methods

Based on the analyses effected, the present solution is aimed at a complex upgrade (technological, functional, content) of the agrarian portal AGRIS in order to comply with nowadays requirements of the users (professionals and general public) and of the latest technologies. Recently, the data are displayed not only by means of PC or portable computer browsers but more and more by means of a wide spectrum of mobile devices, single-purpose devices, software readers for disabled users or full text search engines robots. The portal though has to reflect the quality, relevance and structure of the existing and new information resources and support various technical means. Above all, it has to provide users with authenticated data/information at the shortest possible time and in the quality and format required.

As far as the methodology is concerned, it primarily lies in the analyses of the current AGRIS portal solution, i.e. technological, content and structural analysis. Consequently, user behaviour analysis, availability and quality of information resources analysis, user and technological requirements analysis were carried out and examined. As a result, optimal structure of the individual portal components was designed, meeting user requirements, habits and behaviour. At the same time, it was necessary to design a complex innovation of the most risky portal components in compliance with the newly proposed structure and technology requirements. Subsequently, the above-

mentioned components were redesigned, including the implementation of an analytical tool for an easy and sophisticated user behaviour output. An important step of the new version implementation was its testing on the development platform.

Technical solution

The foremost objective of the innovation was to upgrade the technological solution of the portal. The AGRIS internet portal has so far run on the Microsoft platform, using the MS SQL 2005 [5] database server and Internet Information Services version 6.0 web server to be precise. While creating and developing the portal in the late 90's, the PHP [7] scripting language technology was adopted. Within the next ten years, the potential of the above technology was fully exploited. However, from today's perspective the technology has become quite outdated and therefore unsatisfactory. It was therefore indispensable to search for a new solution that would mainly upgrade the throughput of the portal and the security of the whole system.

In order to implement the changes, the following criteria have been suggested (upon analysis):

- retaining the Microsoft platform (implementation of up-to-date SW versions - IIS 7 [6] web server and MS SQL 2008 [8] database server);
- maintaining current system functionality, independent of design;
- enhancing the overall throughput, stability and availability;
- dividing data, application and presentation layers of the system
- enhancing data throughput of the applications by innovating the relational data model;
- extending the range of services provided (RSS, web services etc.)

To comply with the fore-mentioned criteria, the complex solution of Microsoft .NET technology turned out to be advantageous - from the design stage of the relational data model to the results presentation in the presentation layer. For this kind of large scale applications, it is vital to use a multilayer client-server architecture, involving database separation, transfer of the application logic onto the application server and presentation of the processed data in the presentation layer of the users (a three-layer client-server architecture using www

client). Layers separation enhances system stability, information accessibility and at the same time facilitates further extension of the services provided.

Model-View-Controller **architectural pattern** (hereinafter referred to as MVC) turned out to be a suitable solution for further portal development. MVC architecture separates three basic parts of the application: MODEL (data model), VIEW (user interface) and CONTROLLER (control application logic). The above three components are largely autonomous and therefore changing one of them does not basically influence the others. In order to implement the above changes, it was advantageous to apply a relatively young technology ASP.NET MVC [3]. This technology is a part of .NET Web application framework 3.5 [9] and should gradually replace – within more robust applications – the original one and two-layer architectures. The MVC pattern is depicted in fig. 1.

The Model component provides data access and manipulates the data of the application. This layer encapsulates the real database model and provides others only with the access to data reading and data logging methods. In case of the AGRIS portal, this component constitutes a relational data model, over which this layer operates and, by means of SQL [10] or LINQ [11] language, it supplies data for the other two layers of the application (View, Controller).

The View is situated on the opposite side of the paradigm. It obtains data from the Model and presents them. In case of the AGRIS portal, this layer displays the data (e.g. HTML site or RSS channel). The View is though aimed at presenting the current XHTML [12] webpage of the AGRIS portal.

The Controller component is situated between the Model and the View. It provides communication with the user, reacts on the actions by calling out a certain method of the Model component e.g. after clicking on the "Weather forecast" it provides redirecting to a website with the present-day forecast. The Controller as well deals with active operations, e.g. after inserting the user name and password, it provides user authentication and ensures the action logging.

Another advantage of the ASP.NET MVC application is its relatively easy, comfortable and safe extension to further services. As the layers are strictly separated, it is usually enough to extend the Model by a new functional element and use it simultaneously for the Controller and the View (represented by a generated XHTML page, web service or RSS channel).
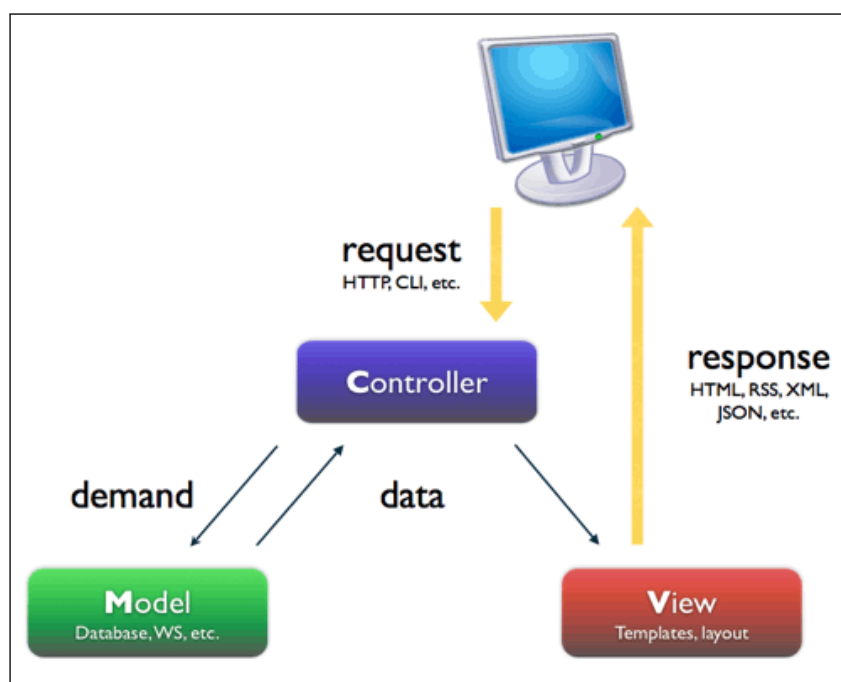

Figure 1: Graphical representation of the MVC architectural pattern [2].

Results and discussion

The presented fundamental software upgrade - AGRIS version 4.0 - has been developed by the Department of Information Technologies FEM CULS (DIT) within the framework of the Research Program of the Ministry of Education, Youth and Sports number 6046070906 as one of the "Information Technologies for Regional Development" sub-period outputs. It was developed prosecuting the first stage of the "Technological and Functional Upgrade of the Agrarian Portal AGRIS" grant that was awarded by the University Internal Grant Agency (in Czech abbreviated CIGA).

AGRIS 4.0 was developed and tested in the course of 2010. The portal is built and runs on well-proven Microsoft technologies within the framework of MS IIS web server. Model-View-Controller (MVC) architectural pattern has been employed. The MVC architecture separates three basic parts of the application: MODEL (data model), VIEW (user interface) and CONTROLLER (control application logic).The NET framework 3.5, or the MVC architectural pattern to be precise, facilitated the upgrade required leading primarily to the enhancement of the overall throughput, stability, system safety and information availability.

Based on the analyses made, the portal functionality has been retained, independently of the basic design. Together with the technological upgrade, the range of portal services has been extended by RSS, web services, map portal etc.

The AGRIS agrarian portal is often employed as a technological platform while realizing educational and research projects. A complex upgrade of the AGRIS portal is sure to promote and reinforce the position of both the Czech University of Life Sciences and the portal itself in terms of potential partnership while submitting and solving follow-up projects, new projects and subprojects at a national and international level. Let us mention for example the topical VOA3R project (Virtual Open Access Agriculture & Aquaculture Repository: Sharing Scientific and Scholarly Research related to Agriculture, Food, and Environment).
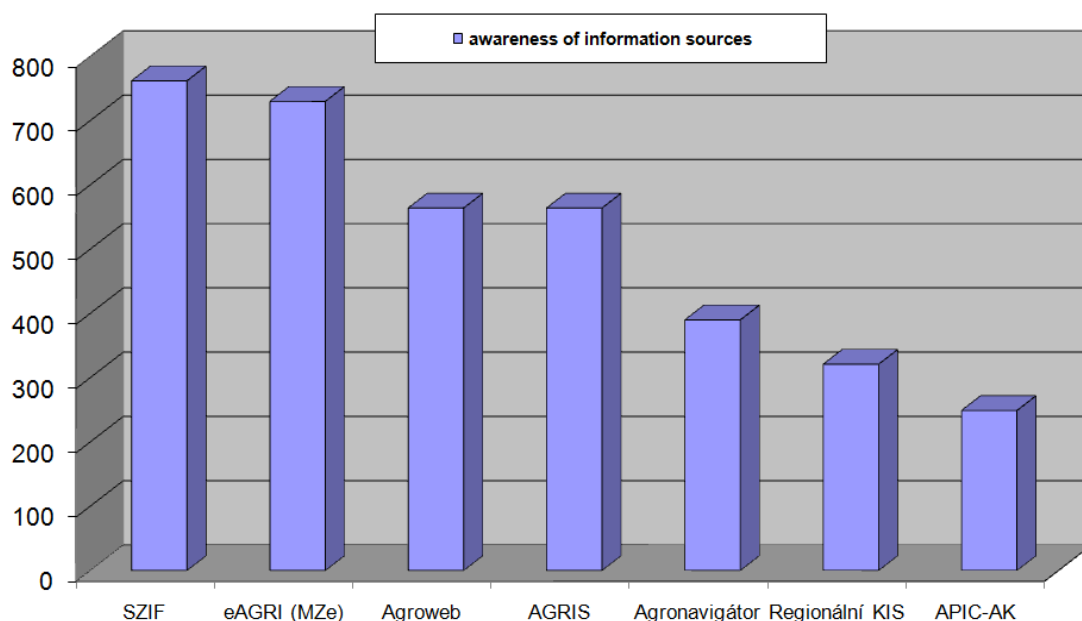
Conclusions

Agris 4.0 is the fourth version of the portal that is now fully verified, field-tested and that shows 30,000 accesses per month. It means that AGRIS is the most visited independent non-commercial departmental information portal in the long term. Enhanced availability and applicability of the information presented constitute an important added value of the portal. The software is fully exploited by the Information and Consulting Centre FEM CULS in Prague that at the same time runs the portal.

Current position of the portal is obvious for instance from the results of a complex survey dealing with ICT development in Czech agricultural enterprises that was carried out by the Department of Information Technologies FEM CULS in cooperation with the Information and Consulting Centre FEM CULS in mid-2010. According to the above survey, the AGRIS portal is perceived very positively by agriculture professionals as one of departmental information sources. Leaving apart state departmental institutions (State Agricultural Intervention Fund and eAgri), the AGRIS portal competes with a professional commercial Agroweb system and is well ahead of all other systems, such as Agronavigator (Institute of Agricultural Economics and Information – ÚZEI in Czech) and two portals of the Agrarian Chamber of the Czech Republic (see fig. 2).

Based on the upgrade realized and further upgrade scheduled for 2011, the AGRIS portal will keep on serving as a unique on-line information resource for the agrarian sector, countryside development and spare-time activity. The portal information will be available anytime, on almost any end-user device, and even with a minimum connectivity. As a result, it will hold its prominent position among quality information resources in the agrarian sector and country areas.

Further AGRIS portal development is scheduled for 2011, primarily within the framework of the FEM Research Program and second stage of the University Internal Grant Agency grant. It will be focused on the innovations that will stem from practical functioning of the upgraded version. The final portal solution will be presented at a

Graph 1: Awareness of departmental www portals – survey 2010 (source: DIT, ICC FEM CULS).

Figure 2: The AGRIS Portal – Main Page (December 2010).

prestigious European conference EFITA 2011[12] (European Federation for Information Technology in Agriculture, Food and the Environment) and other scientific conferences too.

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[12] *www.efita2011.cz*

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