

WWW.HR in Wireless Application Protocol World

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Abstract

WWW.HR is a Web-based information service supported by the Croatian Academic and Research Network – CARNet, that provides general information about Croatia and a directory of Croatian Web sites. In this paper we describe a new service, named WAP.HR, that represents a subset of WWW.HR made suitable for Wireless Application Protocol (WAP) enabled devices. Our goal was to create a simple WAP based user-friendly service with attractive content accessible from WAP enabled mobile phones that will constantly provide up-to-date information. The service provides information about nature, politics, current weather, tourism, cities, important telephone numbers, sport, Internet resources, and two phonebooks. This paper presents new WAP service as a part of WWW.HR development evolution.

Introduction

Mobile communications have met demands of personalized communications and have developed very quickly in recent years sharing an increasing market scale. However, its present single voice and data services no longer satisfy the demand for multiple services. The explosive growth of Internet makes a way for the uniting of mobile communications and mobile multimedia services. The combination of mobile communications and Internet leads to the new wireless Internet technology, based on Wireless Application Protocol (WAP) [1].

WAP has been developed and standardized by WAP Forum [2] with the following objectives:

- 1) To bring Internet content and advanced data services to the digital cellular phones and other wireless terminals;
- 2) To create a global wireless protocol specification that will work across different wireless network technologies;

Solution was found in new layered technology that is based on existing standards and is optimized for efficient use of the wireless network with low bandwidth, high latency, device resources with restricted power consumption and low memory. We tried to combine this new layered technology with present Web-based information service, that is providing regional information concerning Croatia, to create the new information service that will be accessible through WAP enabled mobile devices (especially mobile phones). This paper presents how WAP.HR service was developed. First chapter describes WAP, as the main technology used to develop the new service. In second chapter WWW.HR is described and third chapter deals with the

structure of new service. Its content is described in chapter four and in last chapter ideas for the future work are presented.

1. Description of WAP protocol stack

WAP was developed on the basis of WWW and IP technology. Its logical model is similar to the widely used World Wide Web client/server model. It is necessary for client and server (origin server or proxy gateway) to follow the WAP standard. The WAP uses a layered protocol stack to provide a scalable and extensible environment for application development for mobile communication devices. The WAP protocol stack (Figure1) has six layers, each with its own functions.

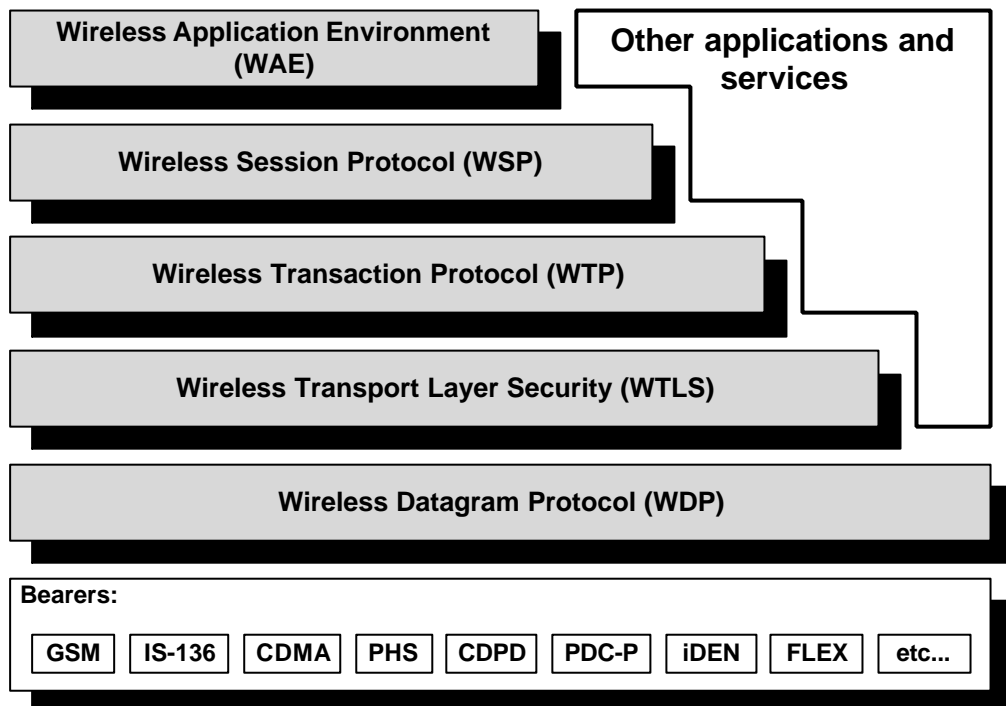


Figure 1. WAP protocol stack [3]

The layers are Wireless Application Environment (WAE), Wireless Session Protocol (WSP), Wireless Transaction Protocol (WTP), Wireless Transport Layer Security (WTLS), Wireless Datagram (Transmission) Protocol (WDP) and Bearers. The WAP application environment consists of a set of standards that collectively define a group of recognized formats for downloadable content and applications, as well as instructions on how application servers should deliver that information to the WAP environment. The WSP layer supports efficient, long-term “conversation” between two application peers. In particular, WSP supports the efficient operation of a WAP micro-browser running on the client device and communicating over the low-band-width, high-latency mobile networks. The WTP runs on the secure or insecure wireless datagram service that is suitable for implementation in thin clients. The WTLS is a security protocol based on industry-standard Transport Layer Security (TLS) protocol (extended Secure Sockets Layer [SSL]) and has been optimized for use over narrow-band communication

channels. Wireless Datagram Protocol (WDP) corresponds to the UDP on WWW. The WDP layer operates above the data capable bearer services supported by various network types, provides consistent service to upper layers and communicates transparently over one of the data capable services which is accomplished by a bearer adaptation. Today there are dozens of network protocols, also known as *bearer protocols*, that are used for exchanging messages, packets or frames to and from the client through various network infrastructures.

2. Description of the WWW.HR service content

WWW.HR is a Web-based information service project that is supported by the Croatian Academic and Research Network (CARNet) and Department of Telecommunications, Faculty of Electrical Engineering and Computing, University of Zagreb. It includes two services, general info on Croatia and a directory of the Croatian Web sites. WWW.HR was first launched as experimental WWW server in late 1993. The server was registered to the CERN international directory of WWW servers in February 1994, among the first public WWW servers in Croatia [4].

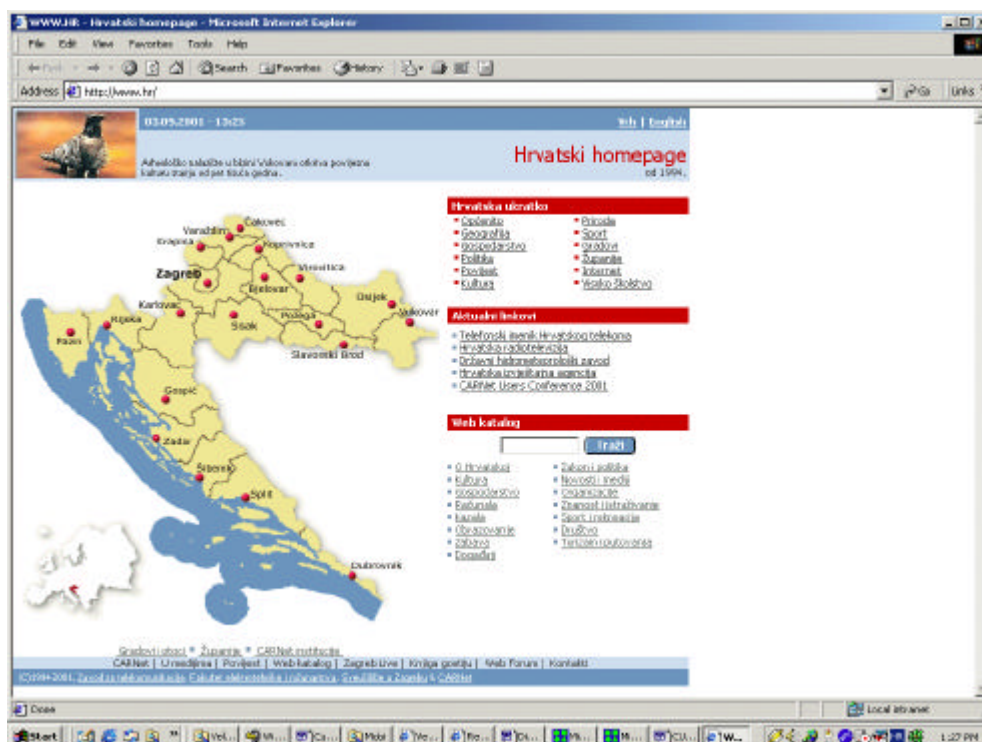


Figure 2. WWW.HR homepage

The structure of the directory of Croatian Web Sites loosely follows that of Yahoo, adapted to the specifics of Croatian web [5]. The 15 root directories include:

- About Croatia
- Art and Culture
- Business and Economy
- Law and Politics
- News, Media, Magazines
- Organization, Societies

- Computers, Networking
- Directories
- Education
- Entertainment
- Events
- Science and Research
- Sport and Recreation
- Society
- Tourism and Traveling

All pages of WWW.HR services are presented in both English and Croatian language. The Homepage of Republic of Croatia contains a set of sub-sites that enable navigation and selection of filtered information about Croatia. This includes:

- National history
- Economy
- Politics
- Culture
- Arts
- Geography
- Nature
- Tourism
- Sports
- Internet resources

Each part of Homepage is covered with up to three sub-sites that are providing a concise overview of the theme and contains relevant up-to-date links to the external web pages.

3. Design & Implementation of WAP.HR service

WAP.HR is envisioned as a WAP-based information service that enables mobile phone users to get a short info about Republic of Croatia over mobile networks. It is important for the new WAP.HR service to be developed to meet demands of new technologies, so that it can evolve to them when they come without any problem [6]. Because of that WAP.HR service was developed with Extensible Markup Language (XML) and Extensible Style Language (XSL). First step in developing was to determinate content of WWW.HR service that is suitable to the behavior, characteristics and limitations of the mobile networks and mobile hand-held devices. Also the new WAP.HR service had to be user friendly, attractive, constantly providing up-to-date information to its users.

3.1. Design

WWW.HR content has too much data and too many pictures to be presented on a small display of mobile device. That was the main reason why the new service does not contain all categories of information that WWW.HR has. WAP.HR categories are:

- Nature
- Politics
- Current Weather
- Tourism
- Croatian Cities
- Important Telephone Numbers
- Sport
- Internet
- HT Telephone Book
- VIPNet Telephone Book

WAP users need fast, up-to-date information. Also, they pay their Internet connections per minute, not per information and amount of data sent and received during the connection. Because of that categories contain only general information, for example:

- I. Nature – contains list of Croatian National Parks with telephone numbers and address of tourist offices in each park.
- II. Politics – contains general information about State authority, Government, President and Juridical system.
- III. Current Weather – information about weather in Croatian towns that are linked to *WAP.weatheronline.co.uk*.
- IV. Tourism – contains information about Adriatic marinas, hotels and tourist offices in selected Croatian cities.
- V. Croatian Cities – contains telephone numbers and addresses of hotels and tourist offices in selected Croatian cities.
- VI. Important telephone numbers – contains list of most important telephone numbers in Croatia such as Ambulance, Police, Fire Department, etc.
- VII. Sports – contains links to WAP sport pages.
- VIII. Internet – contains links to other WAP sites in Croatia.
- IX. HT Telephone Book – link to the Croatian Telecomm phone book.
- X. VIPnet Telephone Book – link to the other Croatian mobile network operator telephone book.

WAP.HR service is organized in such a way that users can access content through any Public Land Mobile Network (PLMN) using any WAP compatible wireless hand-held device with Micro Browser. Figure 3 shows networks and network elements that are passed through by request and reply on their way between client and server using two Croatian PLMN.

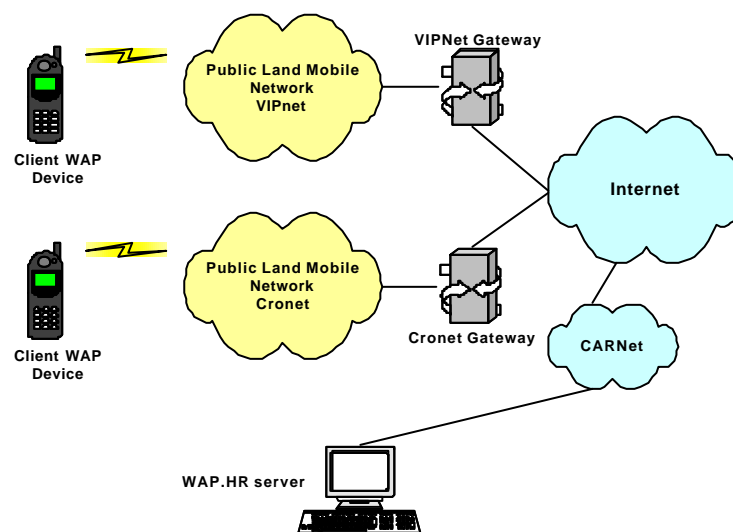


Figure 3. Networks and network elements between Client and Server

For example, when mobile network subscriber wants to access some WAP page his WAP device passes the binary-encoded WSP request over the wireless network to the WAP gateway. The WAP gateway receives that binary WSP request, decodes it and transforms to the Hypertext Transfer Protocol (HTTP) request. The HTTP request is then transmitted towards its destination (WAP.HR Server) through wired networks (Internet and CARNet). The WAP server receives the HTTP request processes it and returns the response over the same path.

3.2. Implementation

WAP.HR service data are saved in XML format that enables simple access and overview of them. Also, XSL is used to transform XML data to the Wireless Markup Language (WML) pages. To provide interoperability between those technologies Apache Web Server, Tomcat Application Server and Cocoon Servlet technology were used. Main reason why all those technologies were used is to insure that all data can be reused once new technologies and new markup languages are developed.

Figure 4 shows the components of WAP.HR Server. As we see Web Server, Application Server, Cocoon Servlet Technology and all XML and XSL files for WAP.HR service are placed on a same computer.

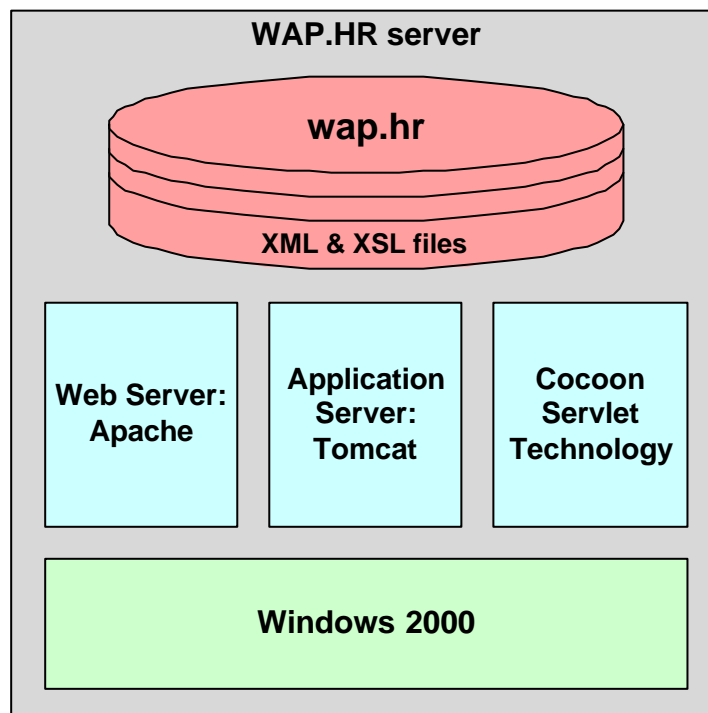


Figure 4. WAP.HR Server Components

4. Future work and conclusion

WAP.HR is simple, user-friendly, web based WAP service that provides some basic up-to-date information about Croatia. At the moment it exists as an autonomous service, but in time it will develop into integral part of

WWW.HR service. First steps in that direction are already done. Also personalization of service will be made, which means that users will be able to organize their personal main page with categories and links that interest them. The majority of current categories will be extended with new information. The quantity and variety of information is expected to grow with the level of informatization in Republic of Croatia and as a new Croatian WAP sites appear. WAP.HR team hopes that in near future WAP.HR service will become as popular in the “wireless world” as WWW.HR is today on the “classical Internet”.

References

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Hrvoje Komericki

Hrvoje Komericki was born in Zagreb, on August 24th, 1976. He attended XV gymnasium in Zagreb. He finished high school in 1995 and continued his education at the Faculty of Electrical Engineering and Computing, University of Zagreb. On May 16th, 2001 he received a bachelor degree at the Department of Telecommunications. His Diploma thesis topic was "Wireless Application Protocol Architecture and Information Services Developing", and the thesis describes development of a new WAP service based on the existing WWW.HR service.

Since June 1st, 2001 he has been working at the Faculty of Electrical Engineering and Computing as an associate assistant.

Mario Kušek

He was born in Zagreb, on November 3^d, 1972. He attended "Ruder Boškovic" high school. He was a member of the team responsible for designing, organization, execution and administration of the school enrollment program. He finished high school in 1991 with excellent grades and continued his education at the Faculty of Electrical Engineering and Computing, University of Zagreb. On June 12th, 1997 he graduated from the University. His Diploma Thesis topic was "Distributed Programming System for Verification of Communication Protocols", and the Thesis described concepts of distributed programming based on Internet, WWW and programming language Java. He presented a paper based on his Thesis on the international conference on telecommunications CONTEL97 in Zagreb. He also received master degree on March 2nd, 2001 with title: "Development and maintenance of distributed Web services and applications".

He has been working at the Faculty of Electrical Engineering and Computing as an associate assistant since September 1997.