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APPLICATION OF INTERNET IN ROAD TRAFFIC ENGINEERING

SUMMARY

The paper deals with the implementation of Internet in traffic engineering with the purpose of improving the professional and scientific research development of the traffic system in the Republic of Croatia.

Fast growth of the world computer network, Internet, and its applications in almost all the fields of human activities, change the picture of the modern world. The current exchange of data in all their forms and the daily growth of the network, supplemented by almost incredible amounts of data that can be almost instantly accessible, indicates that Internet is not just the information technology revolution, but that it is a revolution per se. More than 100 million computers are estimated to be networked beginning of the 21st century.

Internet seems almost as if it were created for the purposes of knowledge and experience exchange in traffic, a relatively young scientific branch. It can be concluded that the presence of traffic engineers in Internet is today's reality and tomorrow's necessity.

1. INTRODUCTION

Fast expansion of Internet in the world and its application in almost all branches of human activities is

changing the image of the modern world. The current data exchange in all their forms and the daily growth of the network itself, supplemented by almost incredible amounts of data that are available at any time, tell us that Internet is not only an information technology revolution, but also a revolution in itself.

Internet seems as if it were created for knowledge and experience exchange in traffic, this relatively young branch of science. It is not only a big computer network, but an international and supra-national computer network which represents a general set of data and people who use them. Internet is the beginning of a general world base of knowledge, news, communication and co-operation.

2. THE INTERNET SYSTEM

The development of Internet started in 1969, in the U.S. agency DARPA (*Defense Advanced Research Project Agency*) for the purpose of developing a unique protocol for connecting various types of computers and networks and their communication. The developed protocol was called TCP/IP (*Transmission Control Protocol and Internet Protocol*).

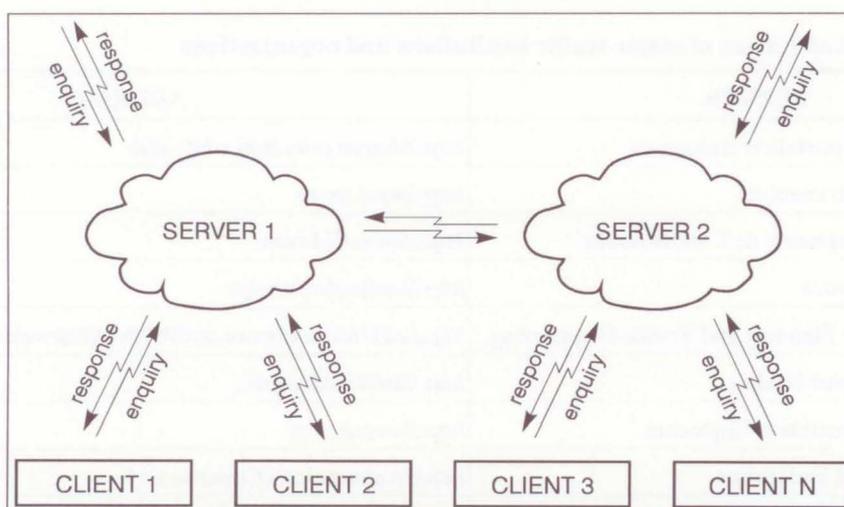


Figure 1 - Internet model as the clients and servers system

Since Internet is an open system, it does not have any control or supervision as a whole, and each organisation connected to Internet is responsible for its role in the network, so that the system leaves an impression of being anarchic. However, the modern information technology, as well as organisation revolution, is at the same time centralised, because it was founded on a unique or compatible software support and basic organisation, and almost completely decentralised. Thus, one can speak of a mono-centric, but also poli-centric, and completely decentralised system. Therefore, it can be said that Internet as a network of all computer networks is a reliable herald of post-industrial information society, where the world as a "global village" becomes a reality. Mobile telephones, besides satellite connections and the possibilities of locating the vehicles by satellites in air and on land, provide already today unthinkable possibilities for using the computer technology, i.e. Internet.

The number of computers linked to Internet has been growing daily, so that now we can speak about the exponential increase in the number of Internet users (internauts). The dynamics of the increase of hosts connected to Internet is characterised by the fact that in January 1993 their number was estimated at 1.3 million, and two years later, in January 1995, it increased to 4.85 million. In July of the same year, the number rose to 6.64 million computers. Today, there are over 10 million with 50 million users, and for the beginning of the 21st century more than 100 million networked computers are estimated.

Figure 1 shows how the Internet system functions, based on the client - server principle. The end user puts a certain demand on the computer connected to Internet and the computer fulfils it. If it cannot respond to the requirement, the enquiry is passed on to another computer in the network, and this continues until the task gets completed.

Since computers multiply their memory capacities with new data every day, the interest for using Internet in such a specific field as traffic is quite understandable. WWW (*World Wide Web*) has become the most interesting network service, using hypertext for the presentation of documents. Its main feature is that it contains links to other documents, which can include text, images, audio and video recordings. Hypertext uses HTTP (*Hyper Text Transformer Protocol*) for data transfer. The address system has also been developed which provides access to data at other network services, and the general form of address is as follows:

protocol://computer/path_to_file/file

The most frequently used tools for searching the WWW are the Netscape Navigator and Microsoft Explorer. These are used to search WWW, download interesting files and send E-mail.

3. SEARCHING WWW FOR INFORMATION ON TRAFFIC

Various search engines can help in searching the world data network, Internet, for a specific field and obtaining of adequate information. These programs provide access to the required data, simply by typing in a certain key word or group of key words.

For help, the most frequently used searching tools are the search engines AltaVista (<http://altavista.digital.com>), Yahoo (<http://www.yahoo.com>) and Webcrawler (<http://www.webcrawler.com>). This method of searching gives good results in looking for a general, well-known term and the related information. The problem arises when we are interested in specific information within e.g. a subgroup of a certain science. Then the search engine might offer us more than 100 000 documents which contain the given keywords. It is practically impossible to analyse all these links, al-

Table 1 - Internet addresses of major traffic institutions and organisations

SERVER	ADDRESS
Directory of Transportation Resources	http://dragon.princeton.edu/~dnh
Fakultet prometnih znanosti	http://www.fpz.hr
Federation Internationale de L'Automobile	http://www.FIA.com
Institut prometa i veza	http://mafz.fpz.hr/~ipv
Institute for Traffic Planning and Traffic Engineering	http://e231ic11.tuwien.ac.at:8080/http/fix/ewelcom.htm#WhatIs
Institute of Transport Studies	http://its02.leeds.ac.uk
Institute of Transportation Engineers	http://www.ite.org
International Road Federation	http://is.eunet.ch:80/Customers/irf
Texas Transportation Institute	http://tti.tamu.edu

though the most significant and adequate ones top the list.

For the purpose of scientific and research work regarding problems in road traffic, Table 1 contains Internet addresses of the most significant institutions and organisations in the road traffic branch, so that by searching these resources the needed data are more easily found. It has been developed by storing the bookmarks, resulting from searching the network.

The servers at these sites indicate other servers, these in turn others, etc., so that it would be best to start from these web sites. The listed sites contain two or more words separated by a full-stop and they represent the full address of a computer (*Fully Qualified Domain Name*), the first one being the name of the computer. The address has two-letter and three-letter extensions at the end, the so-called top-level domains. So, e.g. the abbreviation "com" stands for a commercial organisation, "edu" - educational, "org" - an organisation, etc. Two-letter extension indicates the country where the computer is located, so that "hr" indicates Croatia, "de" - Germany, "it" - Italy, "uk" - the United Kingdom, etc. These addresses are transformed by the computer to IP addresses, so that every computer in the network has its own Internet number. The rule (unwritten) in naming these sites is all the more present. So, e.g. the majority of automotive companies accepted the unification in writing according to the principle:

<http://www.firm.com>
(<http://www.audi.com>, <http://www.fiat.com>,
<http://www.psa.com>, <http://www.honda.com>).

It needs to be emphasised that the data transfer does not flow only in one direction. Additional information, usually the more specific ones, that a conventional user (surfer) would not consider interesting, can be obtained by E-mail addressed to the webmaster.

4. OTHER USES OF INTERNET IN ROAD TRAFFIC

Apart from the possibility of searching huge resources of data, images, audio and video recordings, located all over the world, communicating via E-mail and transfer of voice (Internet voice), Internet offers also possibilities for the development of other activities within the road traffic domain, which, as for now, can only be predicted.

Since the change of information, i.e. their updating by more accurate and more up-to-date information is relatively easy, Internet is suitable for obtaining information about road conditions and weather forecast, as well as the synchronisation with the radio - RDS information (example of Austrian, German and Slovenian

national motoring clubs at the addresses: <http://www.oeamtc.co.at/oeamtc>, <http://www.adac.de> and <http://www.amzs.sl>).

Traffic flows are easily presented with town or region maps in real time (on-line) monitoring the traffic jams, and their fast clearing (the example of the installed CCTV camera - in a closed TV cycle which is used to monitor the traffic http://herman.tamu.edu/cgi-bin/make_labcam_outdoor_html).

Internet provides us with the possibility to monitor the critical sections of the roads and junctions where there is the system for notification on traffic accidents (the example of the installed equipment <http://www.combitech.se>). By comparing a range of images, the processor decides whether there had been an accident, a jam or some other extreme case, at the critical section.

Also the information on city, suburban and international public transport are available, including changes in timetables, data on routes, prices, operators (e.g. the Zagreb Bus Terminal at the site http://www.netstudio.tel.hr/nest/cgi/alkol_odlasci).

The development of the supply and demand market of goods and transportation in domestic and international transport. Since the security system in transferring data has been developed, the secrecy of communication between the service provider and the user is guaranteed, as well as the credit card payments. All the requirements of the electronic cargo transport market have been met, just as in the case with shares.

Internet has also provided the possibility of advertising the means of transport included in the traffic technology. The advantage is that the required performances of a vehicle can be obtained at one place as well as the specific information in traffic.

The possibility of conference work of scientists in a traffic project or study has become almost everyday. The results in individual segments of research can be exchanged daily.

5. INFORMATION TECHNOLOGY IN THE CROATIAN TRAFFIC SYSTEM

Right after Croatia got connected to Internet, the Institute of Traffic and Communications has started creating its own pages, in co-operation with the Faculty of Transport and Traffic Engineering. Thus the proper core of traffic system is being designed. The objective is to connect all the traffic resources in the country and to establish direct connections to the traffic information resources in the world.

Figure 2 presents a scheme of traffic information system development. Internet provides connections with other faculties, institutions, and organisations. This enables the exchange of knowledge and results of

research carried out up to now at the Institute of Traffic and Communications and at the Faculty of Transport and Traffic Engineering, as well as searching of these resources by the users (researchers, students, various other clients). Internet can be accessed by telephone, or by mobile network (option under construction at HPT - Croatian Post and Telecommunications), with HPT as the service provider or CARnet (Croatian Academic and Research Network) intended for academic and research purposes.

6. CONCLUSION

The application of computers in traffic engineering has actually begun with the appearance of first computers which were of great help in iteration processes. The computers of today's generation with sophisticated software help in data processing, traffic planning and design, and they are used in developing projects and studies. They also provide storage of data on permanent media with fast accessibility.

Connecting such computers into a common network such as Internet, provides huge possibilities in communicating, acquiring and exchanging of knowledge and experience in the field of traffic. Networks that had existed before as independent LAN (Local Area Network) are united into one, and provide services to a much greater number of users, increasing the

level of available information daily. Thus, Internet is becoming one of the most powerful aids in traffic engineering, and science in general. Therefore, the presence and participation of traffic engineers in Internet is today's reality and tomorrow's necessity.

Let us also mention that working in such a worldwide network has also its rules. The modes of communication, and behaviour have created a new concept - network ethics - the so-called "netics".

SAŽETAK

PRIMJENA INTERNETA U CESTOVNOM PROMETNOM INŽENJERSTVU

U radu se govori o primjeni mreže Internet u prometnom inženjerstvu u cilju unapređenja stručnog i znanstvenoistraživačkog razvitka prometnog sustava u Republici Hrvatskoj.

Brzo širenje svjetske računalne mreže Internet i njezine primjene u gotovo svim granama ljudske djelatnosti, mijenja sliku modernog svijeta. Trenutačna razmjena podataka u svim njihovim oblicima i dnevni rast mreže, dopunjen gotovo nevjerovatnim količinama podataka koji nam u trenu mogu biti dostupni, govori da Internet nije samo informacijska tehnološka revolucija, već možemo govoriti o revoluciji samoj za sebe. Procjenjuje se da će početkom dvadesetprvog stoljeća biti umreženo više od 100 milijuna računala.

Internet kao da je stvoren za razmjenu znanja i iskustava u prometu, u toj relativno mladoj znanstvenoj grani. Možemo zaključiti da je prisutnost prometnih inženjera na Internetu danas stvarnost i potreba, a sutra već neminovnost.

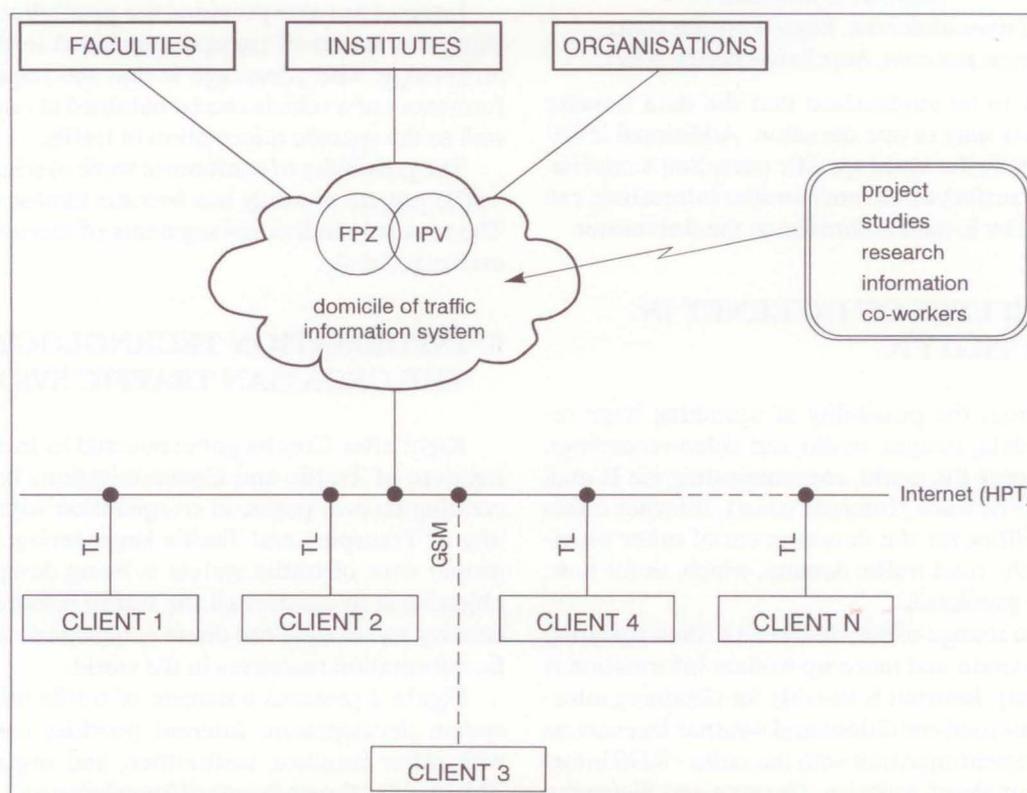


Figure 2 - Development scheme of the traffic information system

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