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EIES - NEW APPLICATIONS FOR AN EFFICIENT CO-OPERATION IN/BETWEEN HARBOUR AREAS

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ABSTRACT

This paper describes the project European Information Exchange Service for the communication between harbour areas (EIES) embedded in the EU program Advanced Communications and Telecommunications Services (ACTS). Especially the different new and advanced services which will be developed during the three year lifecycle of the project between September 1995 and August 1998 for an more effective collaboration between distributed sites are in this context interesting. Therefore, this paper will give you an overview about the several services, the main objectives, the architecture, and the next steps of EIES.

INTRODUCTION

The project EIES started in September 1995 with the definition of the user requirements within the harbour areas of the participated harbours Bremen, Brest, Bordeaux, and Santander. Therefore, user groups were formed in each harbour of different work areas such as ships owners, forwarding agencies, harbour authorities, etc. The questionnaires were evaluated and are necessary for the development of useful and effective new services for the harbour environment. This evaluation and the results of the user requirements were presented at MARCOM'96 from the project partners BIBA (Bremen Institute of Industrial Technology and Applied Work Science at the University of Bremen) and ISL (Institute of Shipping Economics and Logistics) [1]. In the next step, the users were also invited to define the service design, the functionality, and the use scenarios. In the last decade of the project, the users will test the prototypes in real life which were developed in EIES.

Therefore, derived from the user requirements, the scope of the ACTS project EIES is a telematic platform[1] for several harbour regions in Europe. This platform and the services on the top are being developed and implemented. The main issues are[2] :

- Development of an information system for companies and administrations in the port region; for routine tasks as well for exceptional situations,
- Definition, implementation and validation of sample applications in the maritime environment (ports of France, Germany and Spain),
- Use of state-of-the-art network technologies (ATM, ISDN, DSRR, etc.)
- Applications for cargo transport (especially hazardous goods), maintenance and repair as well as maritime transport co-ordination,
- Applicability of the results to other European harbour regions

EIES takes considerations of the users point of view and examine the following users application needs into the special global EIES service with one User Interface:

- Computer Supported Co-operative Work (CSCW)
- Distribution of multimedia information about different databases (BluePages and Port Entry Guide)
- Integration of Electronic Data Interchange (EDI) and Electronic Mail (Email)
- Build-up a global ATM network between the participated harbours for the EIES platform with also network access over lower bandwidth (ISDN direct lines and Internet)
- Mobile Communication (DSRR, DECT and Inmarsat) for the mobile access to the multimedia services

For the realisation of the ATM network platform EIES identified the user requirements, the quality of service and the network requirements for a heterogeneous network. Around in the local network or wide network area TCP/IP protocols are the de-facto-standard for all applications from the user point of view, because the benefits of TCP/IP is the transparency, because it can run over any physical network (Ethernet, FDDI, Token

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[1] by using the following services: ISDN, ATM, Internet, DSRR (Digital Short Range Radio), DECT and INMARSAT for the mobile access

[2] Detailed information can be retrieved via Internet at two locations: http://www.isl.org/EIES/ or http://www.expertel.fr/EIES/.
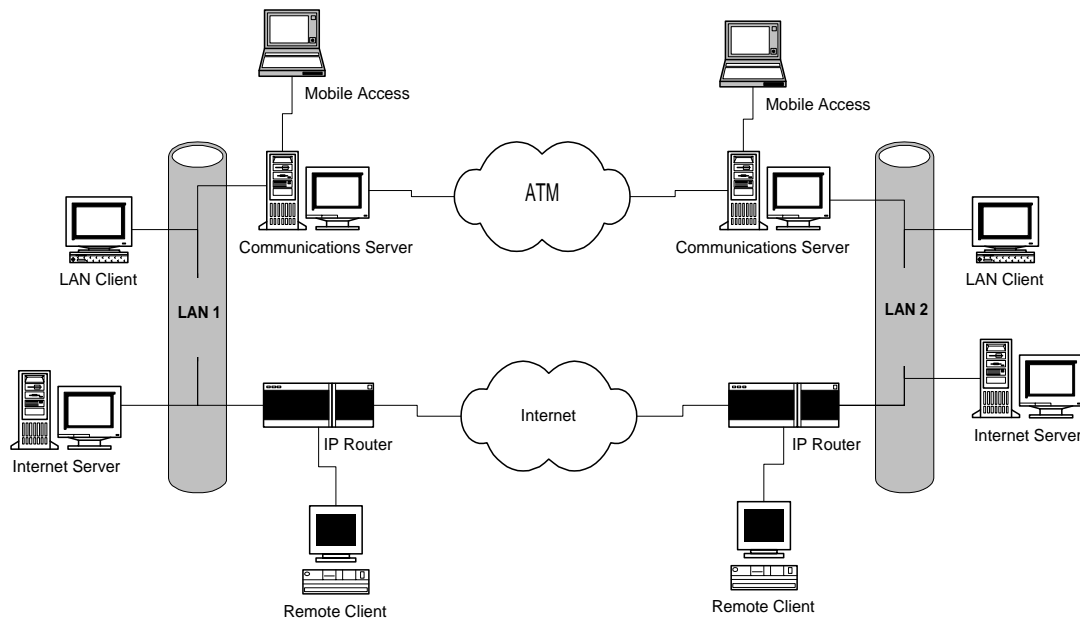
Figure 1: EIES hardware platform [2]

Ring, X.25, Frame Relay, fibre-channel, async, etc. Therefore EIES uses TCP/IP protocols in their heterogeneous network area.

However, TCP/IP protocols are developed for the Internet environment and therefore for very low data rates. Today new applications like Computer Supported Co-operative Work (CSCW) systems with videoconference and application-sharing services fulfil the increasing desire of the user to co-operate over large distances. Higher bandwidth are required to meet these requirements. ATM is the best solution to achieve this objective, but some specifications and customisations on ATM are needed for an efficiently transmission of TCP/IP protocols over ATM.

EIES investigated the possibilities and the bottleneck of IP-over-ATM (IPoATM) for CSCW applications over MBONE tools in a real ATM network environment in Bremen. Also, other demonstrations like the Brussels event on 2nd October 1996 and the trade fair „Global Access Exhibition" in Stockholm on 26-28th May 1997 made measurements over various National Hosts in co-operation with JAMES (Joint ATM Experiments on European Services) possible.

Figure 1 shows the EIES hardware platform which is based on IP/ATM/ISDN routers. IP packets encapsulated into AAL-5 ATM cells are being exchange between the EIES ports. The remote PCs are connected with a TCP/IP stack over ISDN lines via Point-to-Point-Protocol (PPP) to the router. The communication server acts as a bridge between TCP/IP and the mobile access possibilities (DSRR, Inmarsat, and DECT). All applications run over TCP/IP. Therefore, ATM is hidden from the application developers. As IP/ATM routers work in AAL-5 mode, quality-of-service (QoS) features will be concealed from the application developers. This does not affect

data applications (e.g. email, file transfer), but for circuit switched nature applications with real-time behaviour (audio and video data streams). Real-time applications like CSCW are LAN/WAN-based type applications, using IP multicast with ATM/IP routers supporting MBONE for instance.

Using AAL-5 is an attractive way to integrate ATM in the EIES project, because all existing real-time applications use TCP/IP protocol stack. Additionally, the IETF and the ATM-Forum are searching for a better implementation or adaptation for IP-over-ATM, like MPOA and „Native ATM Service" over IP in their own working groups, because they know about the dissemination of the TCP/IP protocol stack. So, in the future it is possible to use a quality-of-service (QoS) if you use the Internet Protocol (IP). Actually, they are defining several additional protocols for variable bandwidth, guaranteed data rates, etc. over IP. [3]

The EIES includes five services. Three of them are really new and are described in this paper: BluePages (BP), Port Entry Guide (PEG) and CSCW. Furthermore, the mobile access to these modules, respectively parts of them will be described.

BLUEPAGES (BP)

The idea of the "BluePages" (BP) is the maritime counterpart of the "Yellow Pages"™ (YP). This service is designed to be used from the Internet. The user can connect to a project's WWW server (for performance reasons every country should have one) and on the first screen an input form is presented. By typing in a person's identification (company name or a keyword, e. g. for a service) a query in the underlying database is initiated and the results will be shown in the browser window.

During the specification of the database model we added some fields to the standard YP entries like present communication links (email, video conference address, etc.) and the possibility to establish the communication directly out of the BP – if available. The definition of the database model is based on Entity Relationship Method (ERM), software-supported by the tool Silverrun which is capable of generating Structured Query Language (SQL) scripts. These scripts were directly used to setup the database in Postgres95.
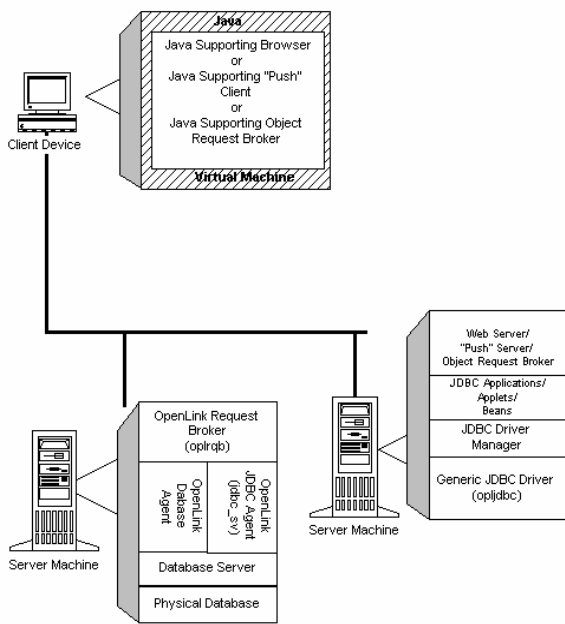

Figure 2: The BluePages system architecture [4]

When we started developing the service, we selected the Relational DataBase Management System (RDBMS) named Postgres95 that was available for free (i.e. public domain software) as well as a commercial software package with customer support. The user interface for the input of data into the DataBase Management System (DBMS) has been written in Java. For this we used SUN Java Workshop version 1.0 and at later stages we updated to version 1.1 which has implications to changes in the source code. The Java/Postgres95 interface was realised with the OpenLink Request Broker's JDBC Agent. In addition we used a Java Class Library (JDBT) which was developed (and is still under development) by teh project partner ISL. It contains classes for designing a user-interface accessing the underlying database tables. Figure 2 shows the relationship between the various drivers and the application on the client and server part.

As described above, based on the user requirement analysis, we chose a PC with MS-Windows for the client. For the services presented in this paper we used

UNIX-based workstations as servers. In most cases these are SUN-stations with Solaris OS 2.5.1, whereeas the web-server is 'Apache' v1.1.1.

During the first phases we experienced in the tests with Postgres95 that the performance the RDBMS can not meet our conceptual requirements, which led to the migration of the underlying RDBMS from Postgres95 to Oracle v7. For the setup of the Oracle tables we re-used the Silverrun script generator. The JDBT offered a class of interfaces for various DBMS so that there were only minor changes to our Java code.

For the search user interface/engine we tried to follow a different technical strategy: a dynamic generation of JAVA script on the database server. The client communicates with a web agent on the database server. After establishing the connection a JAVA application is launched in the server. A JAVA script is transmitted to the client for the control of the communication and the JAVA application on the server connects via a JDBC driver to the database engine. During the user interaction this application generates a context related JAVA script and sends it to the client. The client's web browser executes the script and generates appropriate dialogue elements containing the transmitted data of the result set. The advantage of this strategy is the transmission of only parametric JAVA script templates to the client that results in a maximum performance.

PORT ENTRY GUIDE

The Port Entry Guide (PEG) is based on guides that exist in nearly every port. At present, e.g. in the port of Bremen, the port entry guide is printed on paper and updated every two years. The PEG was ported to CD-ROM. This allows faster updates and more efficient search and presentation of information.

After activation the PEG shows a graphical overview of the location of the port in form of a sensitive map with "clickable" areas. Besides this, there exists a menu for information search in the guide. Ships heading an unknown port need to be informed of the best route to navigate into the port, the port facilities (such as stowing, docking etc.) and costs. In this case the user has to click on the map and gets a zoomed view of the port facilities. He is able to identify easily the suitable location for his vessel to navigate. He has to click on the specific area in the port (e. g. a container quay) and is prompted with relevant information in a table complemented by pictures or even short video sequences. The Geographical Information System (GIS) that is used for the development of this functions is called Visor, a product of the German company

Megatel[3]. Figure 3 shows a GIS example and the service mask in the background.

The PEG part which is implemented in the network (e. g. Internet) contains 'links' to relevant information in the BluePages (e. g. institutions and companies located in the selected port). The CD-ROM edition to be used aboard of ships also includes co-ordinates of key personnel. Summarising, the PEG provides all port related information such as port profile, advertising, acquisition, actual, geographical and technical information.
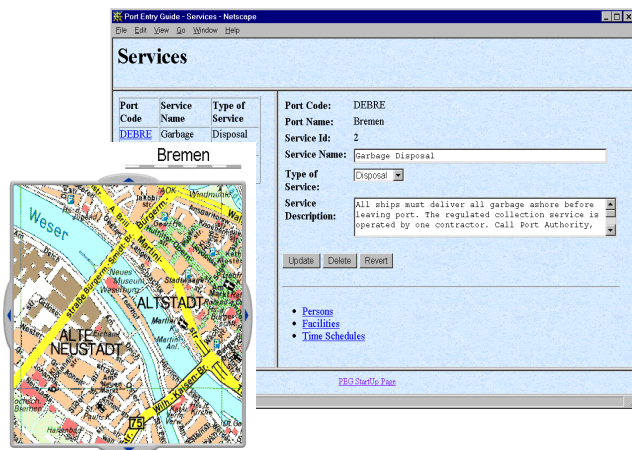

Figure 3: GIS-Interface and Service mask of the PEG [6]

The PEG database system is – like the BluePages – based on Oracle. Connections can be established from fixed networks like ATM, ISDN and PSTN and mobile networks like DECT, DSRR[4] and Inmarsat. This is a further difference between this two databases, because the BluePages system allows as single application only the fixed network access. One unusual feature of the Geographical Information System (GIS) is the hybrid system which allows the combination of network and CD-ROM data. Therefore dynamic data will be transmitted via narrowband mobile or fixed network access, while the data with high bandwidth requirements is available on the client stored on a CD-ROM or via a broadband network – if available.

As stated above the used DBMS includes a SQL interface like the BluePages, allowing mixed use of ODBC databases. For the CD-ROM based single application of the PEG the experience proved to use MS-Access as the database engine. MS-Access allows to setup an executable file without implementation of the whole database on the CD-ROM. This guarantees that the performance of the single application is appropriate and the licence fees can be held low.

CSCW

The Computer Supported Co-operative Work (CSCW) service integrates more than simple video conferencing into the global EIES service. CSCW means video conferencing and application/screen sharing between locally dispersed partners enabling more efficient co-operation. EIES has chosen the MBone tools as a CSCW tool on top of the Internet Protocol (IP). This guarantees high interoperability of heterogeneous environments.

Transmission of data, audio, and video streams takes place over UDP/IP, which has the disadvantage that it does not provide secure data transport. In addition, the different MBone tools 'vic' (video conferencing tool), 'vat' (visual audio tool), 'wb' (whiteboard), and 'nt' (NetText) have to be managed with a separate conference manager such as Confman (a development of the University of Hannover, Germany). A conference management tool is necessary for: run meetings, support planing, initiation, and control of multimedia meetings, and guarantee correct data transmission with an extra protocol.

During the implementation test phase of the MBone tools we noticed that the Confman tool was not easy to handle. Furthermore, the configuration of the software was extremely complicated and was only work efficient in SunSparc or SunUltra environments[5]. Further operation systems were adapted such as Linux and Windows95/NT, but there are problems with the performance and the crash-protection.

To achieve suitable solutions for a user-friendly interface a co-operation was established with the project CONTRABAND, which has developed a conference manger for CSCW tools[6]. The new conference manager included the following features:

- efficient control of the different MBone tools
- confidentiality by closed user groups and encryption keys
- sequence control
- participants search

The main task of this project was to define and develop a conference manager which allows makes a CSCW conference as easy as a telephone conference.

Figure 4 shows a live video conference without a conference management tool, but with all relevant

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[3] megatel Informations- und Kommunikationssysteme GmbH, Bremen, Germany

[4] Digital Short Range Radio

[5] Further problems were 'no real control, just start up and close down of the programs' and 'interface design issues: interface to technical, too much information or too simple for real conferencing'

[6] The working group "Digital Media and Networks" in the technology centre of the University of Bremen is responsible for the project CONTRABAND.

CSCW modules running which was used to solve a problem concerning a broken container with pesticides on board a ship. In this situation, the ship owner, port administration members and a chemical specialist could discuss and speed-up the problem-solving process.
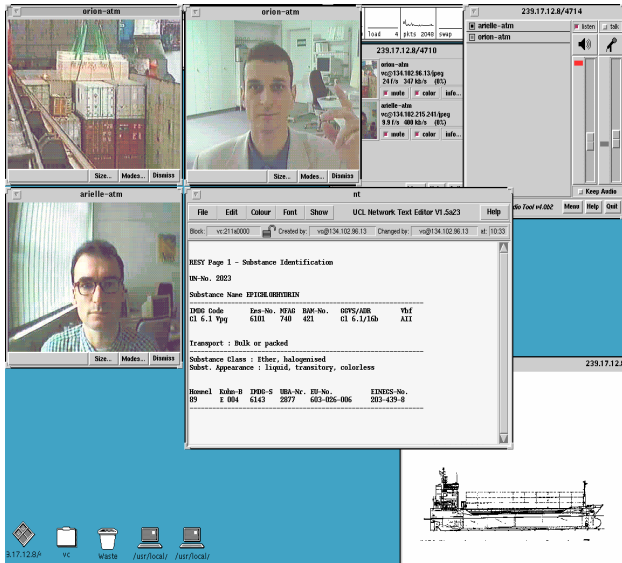

Figure 4: The Mbone Videoconference

Concerning the client machines we found out during the implementation tests that the performance of the MBone tools was poor under Windows95/NT. This led to the conclusion that the MBone tools can not meet the requirements yet. Therefore we are checking Microsoft-NetMeeting 2.0 (current version is 2.1) as alternative. At least for the narrowband connections (64 KBit/s and 128 Kbit/s) via mobile access the CSCW tool has to run efficiently on a Windows client. For this reason some tests will be carried out for the mobile service support.

NetMeeting provides IP transmission in real-time for the support of audio, video, and data. MS-NetMeeting should be used together with the MBone tools, but the real proof of the interoperability is pending. Other problems are the platform dependency and the TCP/IP protocol which is used. That means, the Transport Control Protocol (TCP) needs acknowledgements which slow down the performance of a real-time application. Therefore the MBone tools (UDP/IP) are further the best choice for CSCW applications, but NetMeeting can be a second and meaningful possibility for the mobile access via ship to CSCW tools.

NetMeeting has the following features:

- Audio-, video, and data connection via TCP/IP,
- IPX protocol can be used,
- IP-multicasting (point-to-multipoint connection),
- Windows95/NT as the client operating system,

- Support of H.323 standard.

Concluding the above, there is a variety of CSCW tools lack in performance when used in communication links around 64KBit/s.

MOBILE COMMUNICATION

To enable mobility the EIES system uses three different kinds of radio technologies:

- INMARSAT-HSD (High Speed Data) for ship-to-shore communication at high sea
- DSRR (Digital Short Range Radio) for ship-to-shore communication in port vicinity
- DECT (Digital European Cordless Telephone) for ship-to-shore communication in port vicinity with less requirement in terms of bandwidth and this transmission speed.

For low rate access to the EIES applications cellular systems such as GSM could be used as well. However, EIES focuses on broadband, real-time applications requiring high bearer rate than current available services can provide. Figure 5 gives an overview of the system configuration.

The aim of the EIES project is to provide seamless access to the same services and applications following the UMTS concept. This UMTS concept means to provide mobility and other services to mobile and stationary users in a variety of environments. As the preferred transport protocol between the participants at the different locations TCP/IP is used.
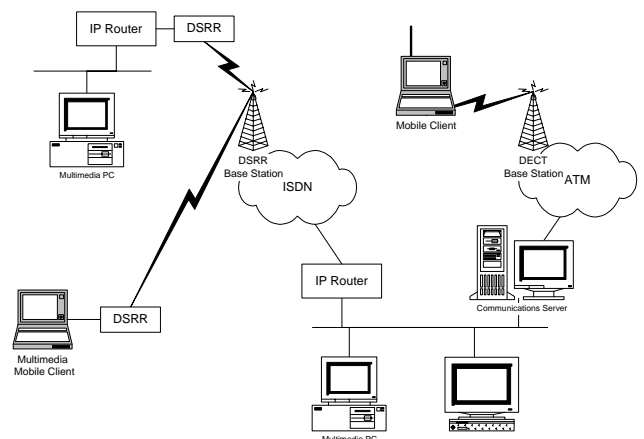

Figure 5: Overview of Wireless Multimedia Demonstrator Configuration

According to the bandwidth of the mobile systems there are some retrenchments regarding the different kind of possible applications. Deviating to ATM and Ethernet connections it is less clever to use the full functionality of the MBone tools such as multi-point video conferencing. All other kinds of application like BP, PEG, and less bandwith critical CSCW tools are

applicable. Potential domains of use for CSCW tools are for example berthing operations or deployments of the fire brigade, the customs or coast guard services.

The PEG as well as the BP could be supported for mobile use by a delivered CD-ROM. This CD could contain all static data of the PEG and the BP. Updates of the dynamic part e. g. information about current availability of port services, should be possible on demand by access to port data bases. Therefore the restriction of the bandwidth is less important.

CONCLUSION

The project EIES will close its work in August 1998. Now, the last decade of the project begins with the start of the pilots: ATM and Internet. That means, direct connections (Permanent Virtual Circuits - PVCs) and Internet access between the different harbour sites will be established. For high performance ATM virtual connections will be used. If there is not a quality-of-service and real-time applications necessary, the narrow bandwidth via the Internet is useful enough.

This prototypes will show how useful are the developed services of EIES for the real users. After this last phase of the project, the project partners will think about the commercialization of the global service. Additionally, a technical-economic evaluation will the advantages explain and allow the change to use the developments after the project's lifecycle.

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