Interactive and real-time help-desk system in electronic shop environment

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Abstract. Today, real-time applications over the Internet are not possible in a sufficient way. The reason is, that the Internet is not able to offer quality-of-service yet. Therefore, interactive and real-time applications in the area of e-commerce get not the needed support and are not successful today. Nevertheless, the research project INTELLECT (http://www.ist-intellect.com), which is founded by the European Commission, integrate new interactive features within an 3D virtual reality eShop system and add a help-desk system which supports real-time and direct communication with the customer. Therefore, this paper will present the current results of the project INTELLECT regarding the help-desk system and its requirements like quality-of-service and interactivity.

1. Introduction

Today's electronic shop systems enable people to select products from catalogues, gather further information, finally order, and pay the articles via a WWW browser. However, most products sold this way are fixed and cannot be customised to satisfy the buyer's requirements. Additionally, there is not enough support available for the customers to help directly and interactive, if there appear questions from the customer about the product or the arrangement of components. The objectives of the European project INTELLECT are to enable the suitable representation of such products in e-commerce systems to achieve the most realistic possible visualisation. New concepts of configuration using 3D user interfaces will enable potential customers to design a product customised to their individual needs and wishes. To get the correct information as soon as possible, a help-desk system will be implemented for a interactive IP communication between customer and supplier. This help-desk will offer support in different categories and lead the customer from component choice till the configuration of the end-product. Therefore, one important aim of the INTELLECT shop is to implement this help-desk system, for those customers that have difficulties with the configuration of the product or with the shop itself. The customer will be able to connect the help desk with a IP (Internet Protocol) videoconference system. Because voice-to-voice communication without visual assist has a lack on information for the help-desk-agent, a page mirroring mechanism will be integrated into the shop. Also desktop sharing features have been evaluated of different tools, which allows a help desk agent to take over control over a browser window of the customer.

2. Specific requirements for INTELLECT modules

The INTELLECT consortium aims to provide an enhanced shop system including all practicable electronic commerce features, and offering a suitable and realistic representation of the products. The INTELLECT application will contain five modules:

1. The eShop will supply the general infrastructure of an e-commerce system (basket, catalogue, secure communications, localisation, multimedia presentations, etc.).
2. The Virtual Reality module will provide a 3D visualisation of the product, and enable the customer to configure its own product by choosing each of its components.
3. The Configurator will support the generation of product variants and tailor-made products as well as offer infrastructure for the administration of products and components.
4. The help desk will provide on-line help to the customer using features like chat, voice over IP and video conferencing.
5. The order-processing module will manage the orders, and offer an interface between the INTELLECT application, and the back office systems.

In this paper the online user assistance via help-desk and the IP communications are the main topics:

a.) Online user assistance by a help-desk system

The goal of the Online User Assistance to be offered through INTELLECT is improving the online shopping experience by emulating aspects of a real shop pertaining to situations where the customer is in need of consulting and product information in general. Community services (like conferencing systems, news systems, etc.) that help create and support the customer community by offering the functionality needed for communication on product issues also helps achieve this goal.

The second goal addressed by the Online User Assistance is after-sales support. The customer must be able to get effective and immediate help on any problems he might encounter with a product he purchased. A study by Forrester Research [4] indicates that 66% of all on-line shoppers during last year's holiday shopping season abandoned their shopping carts before checkout.

Reasons for this could be:

- Customer is not comfortable dealing with an eShop lacking human interaction
- Customer cannot find the product he is looking for
- Customer has problems in configuring the product
- Product quality is not demonstrated in a plausible way
- Customer just wanted to look at the price of the specific configuration

These issues clearly demonstrate the need for further development in the area of pre-sales and after-sales service. Both functions belong to the area of help desk/CRM (Customer Relationship Management) tools, one of the fastest growing markets last year.

b.) IP-based communication

Internet Telephony software allows a multimedia PC to transmit and receive voice (audio), video and text "phone calls" over the Internet. The only costs associated with the service are the regular ISP fee. IP telephony can be employed in two modes PC to PC; and PC to Telephone.

The first method forces the users to essentially schedule calls with others, or to use directory servers listing potential partner. On the other hand, PC to Phone Voice-over-IP (VoIP) the Internet Telephony call is carried over the Internet to a gateway. At the gateway, the call is converted between the Internet and the standard PSTN network. Hardware solutions can enhance the quality of basic Internet telephony via DSP-based voice compression and echo cancellation (e.g. Quicknet Technologies' Internet PhoneJACK).

A video conferencing system consists of the following components: computer, web cam/full-duplex soundcard, headset or speakers/microphone set, and codec for audio/video compression. The following subjects were extracted by examining the features of available products: Live-transmission of video- and audio information, whiteboard, text chat, voice chat, file transfer, application sharing, and Internet directory used to locale individuals.

Leading products are based on H.323. H.323 is an ITU standard (International Telecommunication Union) that describes how a flexible, real-time, interactive set of multimedia communications can be exchanged on packet-based networks like TCP/IP. There are standards for voice, fax and video; it is also important for multimedia streaming. H.323 is a call-control protocol. The protocol stack is running on both machines (end-entities) and it negotiates call set-up, teardown, voice codec used and the relative priorities of voice and data traffic between nodes during the conversation. H.323 also defines other entities for other communication infrastructures, but we will concentrate here on point-to-point communications. H.323 can use G.729a codec or the G.723.1 codec (voice compression algorithms). T.120 is another standard from ITU for data collaboration over the Internet. It handles Multipoint Data Delivery, Interoperability, Reliable Data Delivery, Multicast Enabled Delivery, Network Transparency and Scalability. It can be used for working collaboratively on a document (e.g. application sharing or whiteboard).

Internet Telephony also depends on QoS (Quality of Service) of the TCP/IP connection for a minimum of latency and bandwidth between the two end-users. The IETF specification for QoS (or better Class of Service) is also known as Integrated Services (IntServ) and Differentiated Services (DiffServ). These standards aim to improve the quality of the heterogeneous networks that comprise the Internet in the near future.

3. Help-desk system: mirroring and multimedia pushing

One important aim for the INTELLECT shop is to implement a help-desk system, for those customers that have difficulties with the configuration of the product or with the shop itself. The customer will be able to connect the help desk with NetMeeting. Because voice-to-voice communication without visual assist has a lack on information for the help-desk agent, a page mirroring mechanism will be integrated into the shop.

The project also evaluated the desktop sharing feature of NetMeeting, which allows a help-desk agent to take over control over a browser window of the customer, if the customer has also installed NetMeeting. This approach had to many disadvantages: NetMeeting has to be installed and configured correctly (configuration is not easy for an non professional user). Furthermore it does not work across firewalls and proxies, and as this feature opens a big security hole on the customer’s machine, not many people will install this feature (NetMeeting explicitly warns the user, when activating this feature).

These limitations led to the following concept: Page mirroring means that all actions that are done by the customer in the shop are also executed on a mirroring browser window of the help-desk agent. So the help desk agent is able to recognise the problems of the customer. This mirroring process can change directions, so that the help-desk agent can force the customer’s browser window to execute all the actions the help-desk agent executes in his browser. So the help-desk is able to take over control, to show the customer how to perform the actions he liked to.

Because of the concept of HTTP, page mirroring has some limitations. Normally a web-browser sends http-requests to the web-server every time he needs a page or image. Because HTTP is stateless, the web-server has no possibility to maintain the connection between the browser and himself. After the request the connection is lost. That is the reason why the INTELLECT consortium implemented a polling mechanism.

Every time the customer creates an event in his browser (e.g. clicking on a link, pressing a button, submitting a form, or editing a form element), this event is catched by special EventHandlers written in JavaScript. These handlers parse the supplied information and activate a method in a hidden applet. This applet encodes the event information and sends it together with session information (to identify the customer) to a servlet. This servlet stores the event in a queue.

On the help-desk agent side the hidden applet is working in the so called slave mode where it is polling the servlet. So the help-desk conntects the servlet continuously (because of the HTTP limitations as described above) and asks for incoming events. All incoming events are decoded and a JavaScript command is generated that simulates the event. This instruction is executed with the Netscape JSObject (which is also available in IE). Figure 1 give a short overview about how mirroring works.

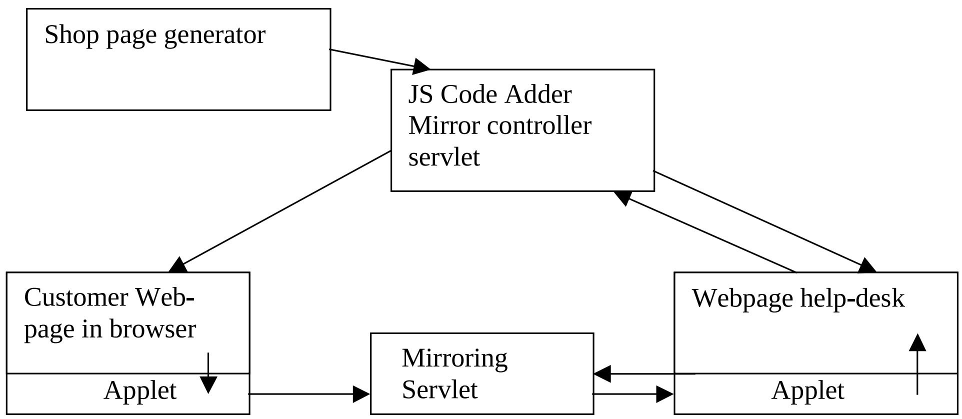

Figure 1: Functionality of mirroring

Before a HTML page is delivered to the customer (either a static page or a dynamic page via Cocoon) it is intercepted by a mirror controller servlet which adds the necessary JavaScript code to the HTML code and also handles the session information for the mirroring process.

All events generated on the customer's web page are sent to the applet which forwards this information to the mirroring servlet. The help-desk's browser's applet periodically fetches all new events produced by the customer.

The web page and multimedia push service will be done at the same way as mirroring. Basically a JavaScript instruction is created and sent to the servlet that stores the request. For the page that should execute it. So the administrator can pop up a new browser window at the customer's side. The browser of the customer must be in a page mirror session in slave mode.

4. IP communication: Computer Supported Co-operated Work (CSCW)

The term Computer Supported Co-operative Work (CSCW) will use in the part of the chapter. It was introduced in 1984 by Irene Greif (Massachusetts Inst. of Technology) and Paul Cashman (Digital Equipment Corporation). CSCW, briefly described, is the technological solution to use computers to assist people doing teamwork. With better performing hardware IP-telephony and video conferencing (VC) has become feasible. By the enormous growth of the Internet, VC has become very interesting for business and consumer. The Internet has made it possible to offer different services into a single platform with low expenditure. Today a lot of companies offer their products over the Internet using electronic shopping systems. These shopping systems are getting more and more efficient but also complicated to handle by end-user. Thus user help has to be included into those shopping systems. [5]

Different solutions are possible:
- Frequently Asked Questions (FAQ) → not all questions are covered
- User help via E-mail → no real-time help, takes too long time for customers
- User help via telephone → extra costs for the customer, sometimes very expensive
- User help via chat → too slow, only for experienced people
- IP-telephony and VC → user friendly but needs bandwidth

In the European project INTELLECT there will be integrate a help-desk system, which is able to support the customer by one-to-one communication. In case of questions, the customer can contact the company's hotline or call centre via the Internet. Internet telephony, online chat system or video conferencing tools could be used to enter the support process. In this final year of the project suitable CSCW systems will be tested, integrated, and evaluated.

The CSCW tools that are tested in this project all contain components with which it is possible to do audiovisual communication over IP based networks. It is possible to use this separately so that it is possible to participate in a VC without the need to transmit a video stream. The use of audio and video data to be transmitted has restrictions. The problem is that IP packages of audio-/video streams are possibly filtered out by firewalls.

CSCW tools imply functionality of collaboration. For usage in a real-time environment of a conference with participants using different CSCW tools the ITU standard T.120 was introduced to guarantee communication compatibility. Different tools are known to do real-time data communication like NetMeeting with was chosen for the project: Whiteboard (WB) applications are used to enable the user to present graphical material remotely. Chat is another form of communication over networks. If bandwidth between participants is limited or if no multimedia communication (audio/video) is possible this form to ‘talk’ with other people is a good alternative of communication. With desktop sharing a user gets access to a remote desktop. The desktop appearance is displayed in a separate window of the CSCW tool. It is possible to administer or control a remote host. Another possible application could be to assist a user e.g. a customer of an eShop in case of questions. [1]

The need of dynamic port handling for doing video conferencing with NetMeeting makes the use of a firewall more insecure. To pass through H.323 control and H.323 streaming the ports between 1024 and 65535 have to be permitted, otherwise video and audio transmission would not be possible. With this computer hackers is offered a wide range of possibilities to attack the net behind the firewall.

Port	Function	Outbound Connection
1503	T.120	TCP
1720	H.323 call set-up	TCP
1731	Audio call control	TCP
Dynamic	H.323 call control	TCP
Dynamic	H.323 streaming	Real-Time Transfer Protocol (RTP) over UDP

Figure 2: Used ports by NetMeeting [2]

The test sequence was as follows:
- Scanning used ports before starting NetMeeting
- Scanning ports after NetMeeting had been started
- Scanning ports after a video conference had been established

The sequence was necessary to investigate which ports are added to the already used ports, when NetMeeting is started and when a videoconference is started. The tests showed that NetMeeting has problems with the Network Address Translation (NAT) of Cisco's routers. This case is well-known from Cisco, but not solved, yet. Additionally, the dynamic ports are a problem, because firewalls can only block defined ports (not all) and open a few for secure communication. To open a defined port for video and audio sessions via NetMeeting is not possible. So, we have a security bottleneck here and have to consider what we can improve for the prototype.

Despite of the restricted settings that would possibly improve communication (e.g. more accurate audio settings) NetMeeting is offering a sufficient quality of audio and video. Nevertheless with communication over low bandwidth networks like the Internet NetMeeting would fall behind in quality aspects of video conferencing. The reason is that the Internet does not have any QoS features. [3]

5. Quality-of-Service (QoS)

The default service offering associated with the Internet is characterised as a best-effort variable service response. Within this service profile the network makes no attempt to actively differentiate its service response between the traffic streams generated by concurrent users of the network. As the load generated by the active traffic flows within the network varies, the network's best-effort service response will also vary. The objective of various Internet QoS efforts is to augment this base service with a number of selectable service responses. These service responses may be distinguished from the best-effort service by some form of superior service level, or they may be distinguished by providing a predictable service response which is unaffected by external conditions such as the number of concurrent traffic flows, or their generated traffic load.

Any network service response is an outcome of the resources available to service a load, and the level of the load itself. To offer such distinguished services there is not only a requirement to provide a differentiated service response within the network, there is also a requirement to control the service-qualified load admitted into the network, so that the resources allocated by the network to support a particular service response are capable of providing that response for the imposed load. This combination of admission control agents and service management elements can be summarised as "rules plus behaviours". To use the terminology of the Differentiated Service (DiffServ) architecture, this admission control function is undertaken by a traffic conditioner (an entity which performs traffic conditioning functions and which may contain meters, markers, droppers, and shapers), where the actions of the conditioner are governed by explicit or implicit admission control agents.

As a general observation of QoS architectures, the service load control aspect of QoS is perhaps the most troubling component of the architecture. While there are a wide array of well understood service response mechanisms that are available to IP networks, matching a set of such mechanisms within a controlled environment to respond to a set of service loads to achieve a completely consistent service response remains an area of weakness within existing IP QoS architectures. The control elements span a number of generic requirements, including end-to-end application signaling, end-to-network service signaling and resource management signaling to allow policy-based control of network resources. This control may also span a particular scope, and use 'edge to edge' signaling, intended to support particular service responses within a defined network scope.

One way of implementing this control of imposed load to match the level of available resources is through an application-driven process of service level negotiation (also known as application signaled QoS). Here, the application first signals its service requirements to the network, and the network responds to this request. The application will proceed if the network has indicated that it is able to carry the additional load at the requested service level. If the network indicates that it cannot accommodate the service requirements the application may proceed in any case, on the basis that the network will service the application's data on a best effort basis. This negotiation between the application and the network can take the form of explicit negotiation and commitment, where there is a single negotiation phase, followed by a commitment to the service level on the part of the network.

This application-signaled approach can be used within the Integrated Services architecture, where the application frames its service request within the resource reservation protocol (RSVP), and then passes this request into the network. The network can either respond positively in terms of its agreement to commit to this service profile, or it can reject the request. If the network commits to the request with a resource reservation, the application can then pass traffic into the network with the expectation that as long as the traffic remains within the traffic load profile that was originally associated with the request, the network will meet the requested service levels. There is no requirement for the application to periodically reconfirm the service reservation itself, as the interaction between RSVP and the network constantly refreshes the reservation while it remains active. The reservation remains in force until the application explicitly requests termination of the reservation, or the network signals to the application that it is unable to continue with a service commitment to the reservation [6]. The essential feature of this Integrated Services model is the "all or nothing" nature of the model. Either the network commits to the reservation, in which case the requestor does not have to subsequently monitor the network's level of response to the service, or the network indicates that it cannot meet the resource reservation. [7]

6. Conclusions

INTELLECT will further work on a help-desk system, which will include interactivity, voice/video support, and high quality. Especially the high quality is necessary for the user acceptance to support voice, video, and critical applications. INTELLECT will integrate RSVP signalling via the IntServ approach, because there is no other possibility today to get a higher quality. Currently, the developed software and the third party products have been integrated at the INTELLECT platform. Since June a first pilot in Austria is tested this platform till November at the end user site to get a direct feedback from the user, because each user requirements which arise during the pilot phase helps to develop further the prototype and get a stable end-system. After the other two pilots (Austria and Greece) will end in November the project will examine the results and commercialise the developed software.

7. References

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