

MediaNote: Ubiquitous mobile collaboration

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1. INTRODUCTION

Much collaboration occurs in the form of conversations about content, such as papers that are being co-authored, reports that are being discussed, etc.[2] However, such collaborations over content are hard to achieve when using small mobile devices. Without access to computational resources normally available at the desktop (e.g., memory capacity, applications, large screens, network bandwidth), current wireless portable devices do not support the richness of collaborative interactions over content that is currently supported on desktop applications or even with paper-based documents. We identified the following two goals as crucial for effective mobile collaboration:

1. Easy access to document content, regardless of the original application format or the device media presentation capabilities (i.e. “If I can read what’s on a Web page from my PDA, why can’t I get to the stuff in my files?”).
2. Easy collaborative document annotation, enabling both creating and retrieving comments on any device currently available to the user.

There exist a number of research systems that address some of these issues. WebSplitter [3] supports collaborative web browsing on multiple output devices, but requires that the author incorporate XML tags into the document to describe roles and devices that can view a given section. The Digestor system [1] processes normal Web pages so that they can be displayed and navigated on small mobile device, and *Documents to Go* suite performs similar function for Microsoft Office documents. Each of these systems works for only a single document type, and none supports document sharing and annotation for collaboration. Lastly, ConNexus/Awarenex [4] tracks users’ current devices, although its application (text chat) does not require adapting the rendering of its content to a device’s capabilities.

2. MEDIANOTE

To address this problem, we have developed a system, called MediaNote, that allows users who are away from the office to share documents and mark up document content with comments—on a variety of devices, and both synchronously and asynchronously. Such document content markup and collaborative annotation is possible irrespective of current device or annotation format. Similarly, retrieval of document contents, document metadata, comments and comment metadata from any device is also supported.

MediaNote achieves this by registering the users’ devices and their capabilities. Documents are displayed in formats appropriate for the device in hand and comments are associated with those

document contents by user selection of document text and of comment feature. Comments are recorded in format supported by the user’s portable devices (e.g., cell phone for voice, text for PDA) or the devices that are available at the location and are associated by MediaNote with a location in the document.

MediaNote alerts users of the comments that have been left for them. Users can select comments, and retrieve comment and document metadata summaries. The current viewing device is known to the system; if this device does not support presentation of the comment’s MIME type (e.g. audio on a PDA), MediaNote recognizes this media mismatch and offers the options of using other appropriate devices (e.g. preregistered telephone numbers where a voice comment can be played) or specifying a new viewing device (e.g. the telephone number of a nearby payphone if a voice annotation is available and no cell phone currently in hand). Because MediaNote “knows” about users and their devices, presentation of materials can be adapted to the current situation.

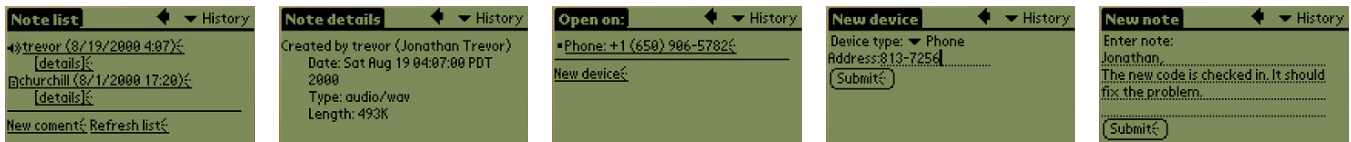
2.1 Scenario of use

While travelling, Davor uses his networked PDA to access the MediaNote system. He logs in and is automatically taken to his new note screen (Figure 1a), where he sees that there are two new comments on the document that his team is currently working on.

Davor can view further information about the comments and about the document that the comments are associated with. In addition to listing the comment’s author and time when it was posted, this information also describes the type of the comment’s content (e.g., plain text, image, or audio) and its length (Figure 1b). The comment metadata can help Davor decide whether to open the comment on his current device, given the comment’s type and size, and the device’s capabilities.

If Davor tries to open a note that cannot be rendered on his device, for example an audio file on his PDA, the system offers him a list of audio capable devices that are registered for him (Figure 1c). Davor selects the first number in the list—the number for his cell phone that he is carrying. The system calls him on the specified number, when he picks up the phone the message is played to him. If he didn’t have his phone with him, he could enter the number of a nearby phone, for example a pay phone (Figure 1d).

Prompted by the comment he has just heard, Davor reviews the document and decides to respond to his colleagues. He selects the “New Comment” option on his PDA. MediaNote offers him a list of known devices on which he can leave a message. Davor selects the current device, his PDA, to leave a new message for his colleagues. He writes the message and presses the Submit option (Figure 1e).



(a) List of new notes (b) Note properties (c) Device selection (d) Adding a new device (e) Creating a new note

Figure 1: Screenshots illustrating the use of MediaNote on a PDA.

2.2 Implementation

Figure 2 shows the system architecture of MediaNote. The key components are the following:

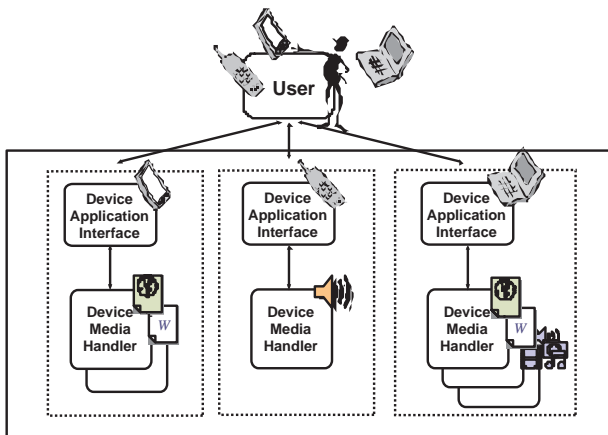


Figure 2: MediaNote architecture

Device application interfaces. Client devices (PDA, phone, web browser and so on) communicate with the system through device application interfaces. These provide access to the system functionality through one or more user-interfaces. The degree of interaction and functionality afforded by the interface depends on the characteristics of the device.

The actual device application interface may be hosted in different places. Thin-device clients (like web-phones and pagers) may have their entire device application interface provided by the remote server as only limited processing can be performed by the client itself (web-phones can only render WML formatted pages in their built-on micro-browser, for example). More functional devices, like a desktop PC, may host the entire device-application interface locally. Other devices, such as a Palm, may have parts of the device-application interface hosted on both client and server.

Device-media presentation services. Each device-media presentation service knows how to access, convert and present the contents of a particular media document mime-type to a particular type of user device. For example, a “palm-application/msword” presentation service can convert and present Microsoft Word documents as small HTML pages on a Palm PDA. A “palm-image/gif” presentation service knows how to take a GIF image and (possibly reducing it if it is too large) present a suitable image on the Palm.

2.3 Current status

MediaNote is implemented as a Java web application that has access to repositories of document, note, device, and user information. The application accepts URI-format requests from web-enabled devices and responds with appropriated rendered content (e.g., document sections, notes, or further user selection forms) in format that the device can handle (e.g., HTML, WML, or voice). Currently, the device application interfaces are implemented for a web-enabled PDA, a WML-capable phone, touch-tone phone, and a standard web browser running on the desktop. The current Media-Note prototype uses a Phonerider telephony board to deliver audio content to a phone and record audio comments.¹

3. CONCLUSIONS AND FUTURE WORK

We have presented MediaNote, a system that allows mobile users to share documents and collaborative annotation regardless of current device or annotation format. The system keeps track of a user’s devices and their capabilities, and offers alternatives to display content that cannot be handled with the current device.

We have implemented a MediaNote prototype that works on network-enabled Palm PDA’s, smart- and regular phones, and the desktop. This prototype uses a static device database, and users have to explicitly add new devices or select alternatives presented by the system for rendering annotations.

We plan to extend this implementation to use Bluetooth for discovery of available rendering devices, both those carried by the user and public devices in the environment. We also intend to deploy the prototype to a set of users to test it over an extended time period.

4. REFERENCES

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¹www.mediaphonics.com