Clotho, a collaborative information weaving tool

by

Alexandre Stouffs

S.M. Computer Science and Engineering, EPFL 1997

Switzerland

Submitted to the Program in Media Arts and Sciences,
School of Architecture and Planning, in partial fulfillment of
the requirements for the degree of

Master of Sciences in Media Arts and Sciences

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

May 2002

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Abstract

Clotho is a collaborative field-reporting tool that provides an environment for gathering stories about a subject or event in a meaningful structure. The relationships between stories constitute the backbone of the structure. Because the main use of the tool is geared towards capturing immediacy, the focus is on mobile devices such as wireless-enabled PDAs. We present the implementation of the tool based on Java and JXME, an open peer-to-peer architecture for mobile devices. An evaluation of the tool and its results are examined.

Keywords: collaborative, linking, mobile, pda, field-reporting, news, peer-to-peer.

Thesis: Walter Bender, Senior Research Scientist, Program in Media Arts and Sciences

Acknowledgments

Thank you to Walter for the patience and the help during my studies in the Lab. My thankfulness goes also to Glorianna and Jack for being my readers. Thanks and good luck to all my friends at the Lab.

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1.0 Introduction

In Greek mythology, Clotho is the Fate that spins the thread of life.

People have a natural need to communicate to others, be it to their family, to the community, or to the world about the events, facts, trends or issues they witness. This communication can occur during a casual conversation, or it can be done in a more elaborate form, such as writing a story. To do this, people are becoming more and more equipped with wireless devices and digital cameras, or devices combining both. If we take as an example the tragic events of September 11th, a large number of websites, bulletin boards, and blogs (a personal web-based diary, the modern equivalent of the Unix .plan file) were created shortly after the events. Those were filled with records of personal experience, in the form of text, audio, and images. Often, these non-professional contributions provided more complete coverage than that of the professional media, because they originated from people with a direct experience of the event. However, a problem with this approach is that all this interesting content is disseminated over dozens of sites. This dissemination leads to a fragmented and often incomplete narrative.

At its inception, the World Wide Web was intended to be a platform on which physicists could organize and collaboratively create documents. It evolved into the system as we know it nowadays, with the collaborative aspect sidelined. However, several initiatives, among them the SilverStringers project at the Media Laboratory [Smith et al. 2000], offer an environment where content produced by the members of a group is collected and edited in a common place.

While these tools work well when topics are well defined, the organization of items is more difficult when topics are created as a result of new events. For these kinds of events, the SilverStringers, for example, use face-to-face meetings to choose

and debate the topics they will cover. In the case of the Junior Journal, another group publishing project that is produced by teenagers spread around the world, topics are selected through email discussions often prompted by subjects in the news that they find of interest to them. A problem is that the stories they write are sometimes bygone because of a one-month publishing cycle. The majority of the collaboration is at the editing-level rather than the story-level. In Clotho, we form the hypothesis of a collaboration in the field, at the story-level.

Clotho enables community members to write and exchange stories. Clotho runs on any Java-enabled mobile device by utilizing a peer-to-peer network infrastructure.

Our purpose with Clotho is to provide people and communities with an instrument enabling them to gather, debate and distribute information on topics in a short time frame (i.e. minutes as opposed to demo or weeks). The intended result of this immediacy is to give members a better sense of what is currently happening in the life of their community —a continuous measure of its pulse. Mobile devices are the ideal platform to achieve this purpose, because one can immediately report on the spot of the event.

To assemble contributions from multiple people in a meaningful structure, we have introduced the notion of labelled linking. Any member can store the meaning of the relation between two stories by establishing a link and giving it a label.

The possibility to form a shared space for regrouping stories on a given topic has the interesting side effect: people who don't know each other can collaborate in storytelling on the same topic.

In the following chapter, we present two scenarios for use of the tool. One is in a planned mode, in which we describe how the tool might have been used in the context of an investigation conducted by a group of journalists. The other scenario develops in an unplanned mode, where citizens witnessing a crime collect information that helps the local authorities in catching the thieves. Chapter 3 spells out the theoretical background of the origins of communities across the ages. It also presents some of most popular tools used for group communication. Chapter 4 exposes the details of the design and implementation of Clotho. An evaluation of Clotho is given in Chapter 5. And finally, Chapter 6 summarizes the points gathered through the work that has been done.

2.0 Examples of use

In this chapter, we present two examples to illustrate uses of Clotho. Because of its versatility, the tool offers two profoundly different ways to engage in its use.

One use is when the people who use it know each other; for example, when there are representatives of a company visiting a convention. In a more general sense, its use results from a task planned in advance, where the roles of the participants are pre-determined with care.

Another use is when participation emerges spontaneously. This use is innovative because rarely do people have the opportunity to collaborate closely without even having prior intention to do so. The transition from an unplanned collaboration to an organized one can occur naturally, because of the very reason of their unsuspected common interest.

My hypothesis is that both uses will result in a more fruitful and richer coverage of an event.

2.1 First use of Clotho: a planned collaboration

Collaborative reporting in 1976... and in 2002

In 1976, a journalist, Don Bolles, who was investigating organized crime in Phoenix, died after a bomb exploded under his car. The circumstances immediately

suggested that he knew too much. Across the country, several fellow journalists decided to collaborate on an in-depth investigation of the statewide criminal activities. However, they didn't want to interfere with the ongoing official investigation of the alleged murder. The journalists rented a room in a Phoenix hotel to serve as a newsroom and shared the information each of them was finding. The files were stored in a file cabinet in the room. (based on information provided by Jack Driscoll, who was one of the investigating journalists).

Now in 2002, how could Clotho have helped a group of professional journalist with a similar goal?

Clotho is a program running on mobile devices. As a result it can be used anywhere, making it highly appropriate for field-reporting. By making use of its wireless capacity, it enables the creation of a shared virtual file cabinet, a sort of replica of the hotel room mentioned above. As soon as a report is entered in Clotho, it's replicated immediately and automatically among all the members of the group.

Another advantage of Clotho is that it allows relationships to be established between individual reports. This leads to a meaningful organization of reports. Clotho also features the possibility of augmenting reports in a structured way. It also features the possibility of enhancing the reports by adding questions and points to resolve.

2.2 Second use of Clotho: unforeseen collaboration

Rebirth of local newspapers

The local gazette of a small town has lost one of its two reporters. The editor wants to give his readers an exhaustive coverage of the events of their town, however he is also facing financial problems. He decides to take a totally different approach to cope with the lack of staff and resources.

His fellow citizens are all potential reporters. So, why not use Clotho, the reporting tool? He runs a story about it in the gazette, asking people to use Clotho on any topic they feel interesting to them.

A few days later, an attack takes place at "Joe's grocery". Jim, who needs a six-pack of beer, is about to enter the store, when he hears two loud shots inside. At once, he runs for cover. Two unidentified men emerge with a brown bag from the shop, jump into a waiting green sedan, and dash away. Jim, still scared, hesitates to look up.

He finally comes out from his cover to check inside the shop. The sedan is already far away. Joe being severely wounded, Jim grabs his cell phone and calls for help.

Molly, living two houses away, has also heard the gunshots and sees distinctly two men immediately after coming out of the shop and jumping into a green car.

She picks up her Clotho-enabled cell phone and submits what she has just witnessed.

Once Joe is taken care of, Jim decides to write an account of the attack on his Clotho-enabled cell-phone, giving the details about the car. Jim's story is stored in the event topic created by Molly in Clotho (see Figure 1, left). Since he did not manage to get the license number, he attaches a question to his report to find out if anybody has taken down the number of a speeding green sedan (see Figure 1, right)

Figure 1: List of topics currently in Clotho (left side); list of reports contained in the "Robbery at Joe's" topic (right side).
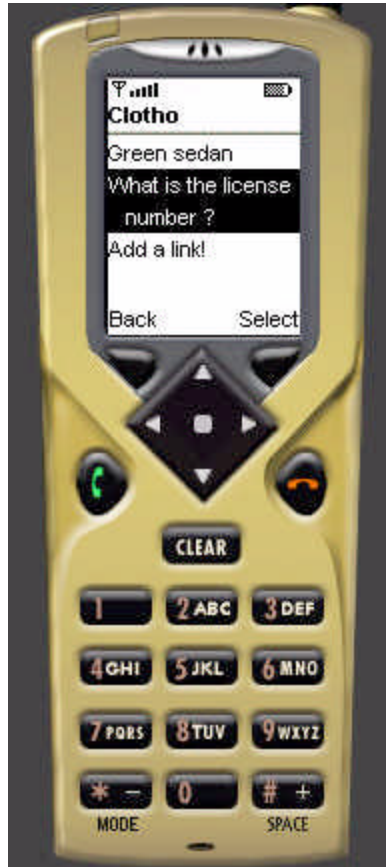
Figure 2: The report with the question 'What is the license number ?' associated to the 'Green sedan' report.

At the other end of the town, Jeff is crossing Main Street, when a speeding green car narrowly misses running him over. Angry, he manages to notice the plate number and writes it down. He consults Clotho to find out if anything suspicious has happened recently. Indeed he reads Jim's report about the robbery. It is asking if anyone has seen a green car and taken down its number. Understanding that he holds an important piece of information, he submits it in Clotho (see Figure 2).

Meanwhile, Marshall Tom, who leads the investigation of the robbery, consults Clotho for any useful clues. He finds the license number given by Jeff. This information gives a precious head start. He can now launch a manhunt.

On his side, the editor of the newspaper now has enough information to send his only reporter to interview the witnesses and write a detailed and accurate story about the robbery.

Summary

With these two scenarios, we have a sketch of real-life situations of possible uses of Clotho that validate our initial intuitions. Among the lessons we draw from these scenarios is the notion of a common space where stories are shared and can be debated. Another aspect is to be able to establish the chronology of events, in order to put forward what's new. We also note that a local event or topic has the potential to gather people only when they know about it. Clotho allows people to be more aware of their community and helps them react.

3.0 Theoretical framework

> A popular government without popular information, or the means of acquiring it, is but a prologue to a farce or a tragedy, or perhaps both. Knowledge will forever govern ignorance, and a people who mean to be their own governors must arm themselves with the power which knowledge gives.
>
> *James Madison*

> I know of no safe depository of the ultimate power of the society but the people themselves, and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not take it from them but to inform their discretion.
>
> *Thomas Jefferson*

3.1 On the need for exchanging and sharing

Humans have always felt an urge to speak, whether by grunts, shrieks or murmurs during the prehistoric times or through the polished languages of our times. Language is also the holder of knowledge and vector of its transmission. Initially, most of the communications were oral and later took the written form. Despite a transition to a written form, the oral one has remained ingrained in day-to-day communications among people.

We have seen its perpetuation in the agora of the Ancient Greeks, in the taverns of the Elizabethan period and in various political, social and religious activities of modern times. Coffee houses sprung up as places to talk, and more recently the Internet has become one of numerous ways to share thoughts, experiences and stories.

Roy Oldenburg in his insightful book, "The Great Good Place" subtitled "Cafes, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts, and How They Get You Through the Day" [Oldenburg 1989], proposes precisely the concept of the "third place", distinct from home (the "first place"), and the workplace (the "second place"). People choose these "third places" to spend time "hanging out" with other like-minded people. The main attributes of these "third places", listed by Oldenburg, are the following:

- "*Conversation*" is the main activity.
- "*A low profile*", which means that the place should have no pretense.
- "Accessibility and accommodation", enabling one to go there at any time of the day, and offering the possibility of meeting acquaintances.
- "*A leveler*", where social differences fade away, giving opportunity to meet other people coming from different worlds.
- "*On neutral ground*", which does not keep a memory of the opinions that were expressed previously.
- "*Regulars*", assuring a group you'll always expect to see.
- "A home away from home", which is an easygoing environment that can adapt to one's current state of mind, by going to one group or another.
- "*The mood is playful*", where people can express themselves without consequences.

3.2 On the need of humans to gather

> Members of Florentine choral societies participate because they like to sing, not because their participation strengthens the Tuscan social fabric. But it does.
>
> *Robert Putnam* [Putnam 1993]

3.2.1 Human societies

Man sometimes imagines that he obtains anything he needs without the assistance of someone else. But it doesn't seem to work that way. The interdepen-

dence of humans has already been exposed by Ibn Khaldun, in a surprisingly detailed manner, in the 14th century [Khaldun 1969]:

> "Human society is necessary. Philosophers express this truth by saying that man is social by nature, i.e. he needs a society, or city as they call it.
>
> The reason for this is that... each individual's capacity for acquiring food falls short of what is necessary to sustain life. Even taking a minimum, such as one day's supply of wheat, it is clear that this requires operations (grinding and kneading and baking) each of which necessitates utensils and tools, which presuppose the presence of carpenters, smiths, potmakers, and other craftsmen. Even granting that he eats the wheat unground, he can only obtain it in that state after many more operations, such as sowing and reaping and threshing, to separate the grain from the chaff, all of which processes require even more tools and crafts.
>
> Now it is impossible for an individual to carry out all the above-mentioned work, or even part of it. Hence it becomes necessary for him to unite his efforts with those of his fellow men who by co-operating can produce enough for many times their number."

3.2.2 Human communities

One can infer from the above that societies are based on physical needs, whereas communities are based on social and cultural interests and/or personal longings.

Smith et al. [Smith 2000] mentions McMillan's [McMillan 1986] four characteristics of a community as follows:

•*Spirit*: a setting where we can have connections to others, but where we can be ourselves. There should be a sense of "emotional safety", "boundaries", and a "sense of belonging".

•*Trust*: there should be some sense of order. We know that some in the community have more power than others, but we acknowledge and trust that structure.

•*Trade*: a sense of how members benefit one another and the community. The ideal is to "transcend score-keeping and... enjoy giving for its own sake".

•*Art*: "a shared history, that becomes the community's story, symbolized in Art".

One can add a characteristic: the relation of the community towards society, which we will name '*Leverage*'. A group of many people can voice its opinions in a very forceful way. A closely related notion is the one of '*Visibility*': a group that is publicly active in promoting its opinions and actions, builds up its leverage.

To illustrate these characteristics, one can refer to the "SilverStringers" of Melrose, a community of senior citizens engaged in publishing their electronic newspaper. The group was created through the initiative of the MIT Media Lab in 1996. The '*Spirit*' characteristic is naturally satisfied by the fact that its members are from the same town and are all retired people who thus have a long history to share. The notion of '*Trust*' is apparent in their activities in the editorial board of their publication. As to the '*Trade*' characteristic, the members of the board were

eager to discover new computer technology which could be of use in their own private lives and help them to be more efficient in their storyteller roles. '*Art*' is conveyed by their stories, pictures and illustratations of the history of the community and more importantly of its members. '*Leverage*' can be illustrated by the fact that their reputation has won them a trip to Ireland to explain their experience in storytelling on the Internet, and a fast Internet access in their senior center, thanks to City Hall.

3.3 How to sustain communities and nurture them?

A way to sustain and make the community grow is through an efficient environment for sharing, discussing, and debating any subject. By definition, the mass media such as newspapers and television cannot fulfill the need to exchange, because they are essentially going from the sender to the receiver, fostering very limited feedback.

Since the Internet was created, many ways to use it as a communication means have been invented. We cover here some of these solutions and the way they can help communities in creating a 'Virtual Common', reviving the now extinct place where people met and shared the latest news and their experiences.

In 1994, Doug Schuler [Schuler 1994] referring to Tom Grundner, introduces the idea of participatory medium, describing its components as follows:

•*Community-based*. Since the systems are community-based, the participants have aspirations, needs, and issues in common. The system promotes participation because everyone has a stake.

•*Reciprocal*. Any potential "consumer" of information, commentary, issues, or questions is also a potential "producer".

•*Contribution-based*. Forums – both moderated and un-moderated – are based on contributions from participants. Any input to the forum becomes part of the forum itself – a record which can be printed, distributed further, or acted on.

•*Unrestricted*. Anyone can use the community network. Furthermore users have control on their postings, although there are usually limitations on postings that are considered harassing, libelous, or criminal.

•*Accessible and inexpensive*. The systems are readily accessible from a variety of public as well as private locations. Furthermore, the systems are free of charge or have a very low charge.

•*Modifiable*. Since the software is the substrate, community networks are (at least potentially) modifiable in several ways. Users can actually design or co-design new user interfaces or services.

3.4 Existing community-enabling communications tools on the Internet

Taking as a basis the previous elements, we can now examine the existing community-enabling tools. Then we will present the tool we propose.

3.4.1 Mailing lists

A mailing list is an automated e-mail system on the Internet, which covers one subject matter. New users subscribe by sending an e-mail and subsequently receive all new postings made to the list automatically.

Inconveniences: access is restricted to the subscribers, an outsider having to subscribe in order to check the content of a list; the exchanges are not intended to be published outside the list; treating a particular subject over a long period of time is difficult; a new topic of discussion (a new mailing list) is difficult to initiate because someone requires to make it known to others who could be interested.

3.4.2 Newsgroups and other threaded communication tools

Newsgroups are a public place where messages are posted for public consumption and response. Contrary to mailing lists, newsgroups don't require users to subscribe.

Inconveniences: absence of any limitation of access can bring in unrelated topics, such as advertisements, and no possibility to establish a dynamic link between two different threads.

3.4.3 Blogs

A frequent publication of personal thoughts and Web links. Chronological ordering of the entries make it easy to find new content.

Inconveniences: not collaborative, focused on a single person's interests.

3.4.4 Community-made online publications

The SilverStringers project at the MIT Media Lab resulted in tools that allow communities to collaboratively create their own publication on the web. The tool is based on the way a real newspaper is produced. Discussion around the stories to be published offers the opportunity to have exchanges between community members.

Inconvenience: the possibility of debate is limited. It is not available for on-the-go storytelling.

3.5 A new community tool: Clotho

Why a new tool?

To make the process of writing, more interesting and more dynamic, we decided to gea our tool, Clotho, towards the coverage of actual, close events. We surmise that people are interested in discussing what happened recently around them, and also the unusual. By providing people with the environment, where they can start to discuss with others they don't know but who are also interested in the same subject at that moment, we hope to foster a debate where each can give his opinions, his view.

To overcome the inconveniences we noticed above, we propose Clotho, a tool with the following features:

- New topics can be created easily.
- Focus is put on events happening recently, in order to raise people's interest.
- Relations between stories can be established with links.
- Questions can be posted in order to create interaction.
- Stories are dated in order to be able to easily find new items.

We intend this tool to be used on wireless devices to increase its ability to cope with immediacy.

The next chapter presents the details of the tool from the viewpoint of its design

and implementation.

But before that, one must emphasize the difference between Clotho and the Semantic Web initiative proposed by Tim Berners-Lee [Berners-Lee 1998], whose goal is to make content processable by machines, and thus to allow them to execute tasks on it: "By doing so, we will enable them to solve problems that we find tedious, to help us find quickly what we're looking for: medical information, a movie review, a book purchase order, etc."

The semantic web as it is currently defined aims to add a semantic level to raw data through predefined ontologies. The goal of Clotho is different; its content is not intended to be used by machines but by people. Because humans do not have the problem of extracting meaning out of data, but rather have the problem of absorbing large amounts of data, Clotho aims to be a support of navigation and organization of the content (stories).

4.0 Design and implementation

4.1 Design

The design of Clotho, as a tool to facilitate and induce collaboration, results from the observation of existing tools and their drawbacks mentioned in the previous chapter. In this chapter, we examine more in depth the suggested solutions put forward in the previous chapter.

4.1.1 Chosen solutions to the drawbacks

We will consider the proposed solutions by answering questions regarding collaboration and similar reports.

A. How to support and foster collaboration?

1. Natural grouping of related reports

When someone starts to use Clotho, he is presented right away with a list of the current topics that are already being covered by others. He can enter in his topic of interest. He sees the list of the titles of the reports already present in Clotho and reads the ones that interest him. If he has new facts on the topic, he adds his own report. If the topic that interests him does not exist, he can create a new one and put in his report.

2. Anytime, anywhere, on any occasion

Mobile devices give the opportunity to seize the fleeting moment or engage at any time and in any place in an interest we pursue. That is why Clotho was specifically conceived for mobile devices.

3. Timestamping of topics and reports

Reports created in Clotho are automatically dated. Topics are also. Each time a new report is added to it, it rises to the top of the list. Readers can thus immediately see what are the hot topics and reports. And this gives a sense of the ongoing collaborations.

B. How to relate the reports created by different people?

1. Linking to other reports

The contributor of a report can also establish links between his report and any other specific report in the topic. If he sees another report that relates in some way to his report, he is given the possibility to establish a link.

Concretely the user creates a link between two reports and qualifies the link between them by using a label. For example, report "Terrible catastrophe on Main Street" connects through the link labeled "details: the causes of the accident" in report "Police investigation summary". The result is in fact a collection of reports written with various angles of approach, be they coming from a community of

loosely connected groups of people or a group of collaborating users.

2. Querying

Going deeper into its linking mechanism capabilities, Clotho offers contributors the opportunity to post queries they might have on a report. Posting a query consists of the creation of an open link that does not have a report at the other end of the link. For example, the report "Concert at Symphony Hall" with an open link labeled, "Who was the solo violinist?". Someone who can answer will just add to the open link a report containing the answer. Because most questions involve two persons or more, they can very naturally give rise to a debate. The debate is by definition an exchange of opinions, a sharing of ideas, coming close to the notion of the "Virtual Common" mentioned in Chapter 3.

4.1.2 Selection process of environments and techniques

In this section, we give an overview of the techniques and environments considered for implementing Clotho. In our search for the best and most appropriate implementation platform, we kept constantly in mind the idea of being able to run on the largest range of devices. We opted for the Java programming language in its light version, the Java 2 Mobile Edition. This permits us to run Clotho on any of the numerous and ever-growing devices featuring it. This also translates into the following criteria: being able to run on devices with the constraints of inexpensive mobile devices which have a limited amount of memory (between 128kb and

512kb), and a slow CPU. This corresponds to the Connected Limited Device Con-figuration (CLDC) of Java 2 Mobile Edition.

In our search for the optimal environment, we looked at the following components needed for Clotho, by considering:

- Graphical User Interface toolkits
- Application communication
- Devices
- Data transmission

1. Graphical User Interface toolkits

Table 1 below presents the different GUI toolkits that we have considered for use in the interface of Clotho. As previously said, we have maintained our focus on the portability and size issues. These are listed according to the following constraints: portability, size and graphical features.

GUI Toolkits	Portability	Size	Features	Comments
KAWT	Efficient on PalmOS	150kb	Almost a complete AWT* implementation	Too much for a cell phone screen
Nextel toolkit	Designed for Motorola cell phones	128kb	Rich set of graphical features	Motorola oriented
MIDP 1.0	Designed for any CLDC devices	Less than 128kb	Includes UI, HTTP, etc.	Lightweight, all-including package

Table 1: GUI Toolkits

* AWT: Abstract Window Toolkit, the first graphical toolkit of Java.

Choice: After evaluating the pros and cons of each, we finally selected MIDP, because of its portability and small memory foot-print.

2. Application communication

Table 2 below outlines the ways of communication that Clotho could use to share and replicate the reports among the members of the community. It should be noted here we considered different ways of communication: generic browser access, client-server, peer-to-peer.

Protocol	Architecture	Size	Features	Comments
HTTP (HDL)	entirely server based	HTTP browser	XSLT, and already written!	doesn't support replication
JMS* for J2ME	client-server	150kb	publish-and-subscribe	very good, but overkill
kXML-RPC	client-server	60kb	remote method invocation	only one-to-one
JXME**	peer-to-peer	10kb	decentralized	simple enough for small devices

Table 2: Protocols

* JMS: Java Messaging Service

** JXME: JXTA for Java 2 Mobile Edition

Choice: Here the selection was more delicate, because of the availability of a greater number of solutions. We hesitated between JMS and JXME. The first is a mature environment, while the other is still under development. However, we chose to take the more promising path of JXME, the open source mobile peer-to-peer technology.

3. Devices

For the selection of the evaluation device, we had a whole range of options. This is due to the choice of Java 2 Mobile Edition (J2ME), which has been widely adopted by the constructors of mobile devices. However, the availability of the

devices is limited, because they have only just been released or will soon be. This includes the "PalmOS-based cell-phone PDA Treo" from Handspring, the "Motorola A388 cell-phone PDA", or the more innovative but still not yet released "Danger" device. Because of the scarce availability of the devices during the evaluation, we had to opt for the unwieldy Compaq iPAQ without a keyboard.

4. Data transmission

Because Clotho uses Java and because MIDP 1.0 is HTTP based, it is completely independent of the lower communication layers it is used on. Therefore, the choice is not really one, because it is essentially tied to the selected device. In our case, we are using 802.11b for data transmission. 802.11b has the interesting capacity of not depending on an existing wireless infrastructure. It can work as an ad-hoc network.

Choices summary

- MIDP 1.0 for the interface
- JXME for application communication

4.1.3 Interface

The interface of Clotho resorts to an extensive use of lists.

Because Clotho is aimed to be used on devices with a basic set of keys, we have decided to simplify as much as possible the navigation (see Figure 3) through the information stored on Clotho (reports, links). Only two keys are sufficient to jump from the list of topics (most general view), to the list of reports within a topic, and finally to the list of links of a given report (most detailed view).

Having in mind this navigation scheme, we can now delve into the different types of lists that exist in Clotho.

1. Lists of topics

The first list displayed when a user enters into Clotho is the list of topics available in the system. It corresponds to the list of topics being currently treated by the users. The user can enter in one of the topics. If he doesn't see a topic of interest, he can easily create a new one, using the "add a new topic" function. If he chooses this function, he is presented with a field to write in the name of his new topic. He can save it or cancel its creation. As soon as he has saved his new topic, all the other users have their list of topics immediately updated.

2. Lists of reports (in a given topic)

This list contains all the reports of the topic currently accessed. From here, the user has two choices: he can either access a report or create a new report. In the first choice, the user is presented with a list containing the name of the report and

its associated link labels (see below).

3. List of links of a given report (in a given topic)

This list is composed of the title of the selected report and a list of the associated links labels. The user can either select the report to see it, or follow a link and see the report that is on the other end of the link. He has also the possibility of establishing a new link to another report. To do that he types the label for the link, that qualifies the relation between the two reports. The user can also choose to create a link which has no report at its end. In that case, he can ask a question concerning the report. by typing the question on the link label. The other users respond by making the link point to another report which will contain the answer to the question.
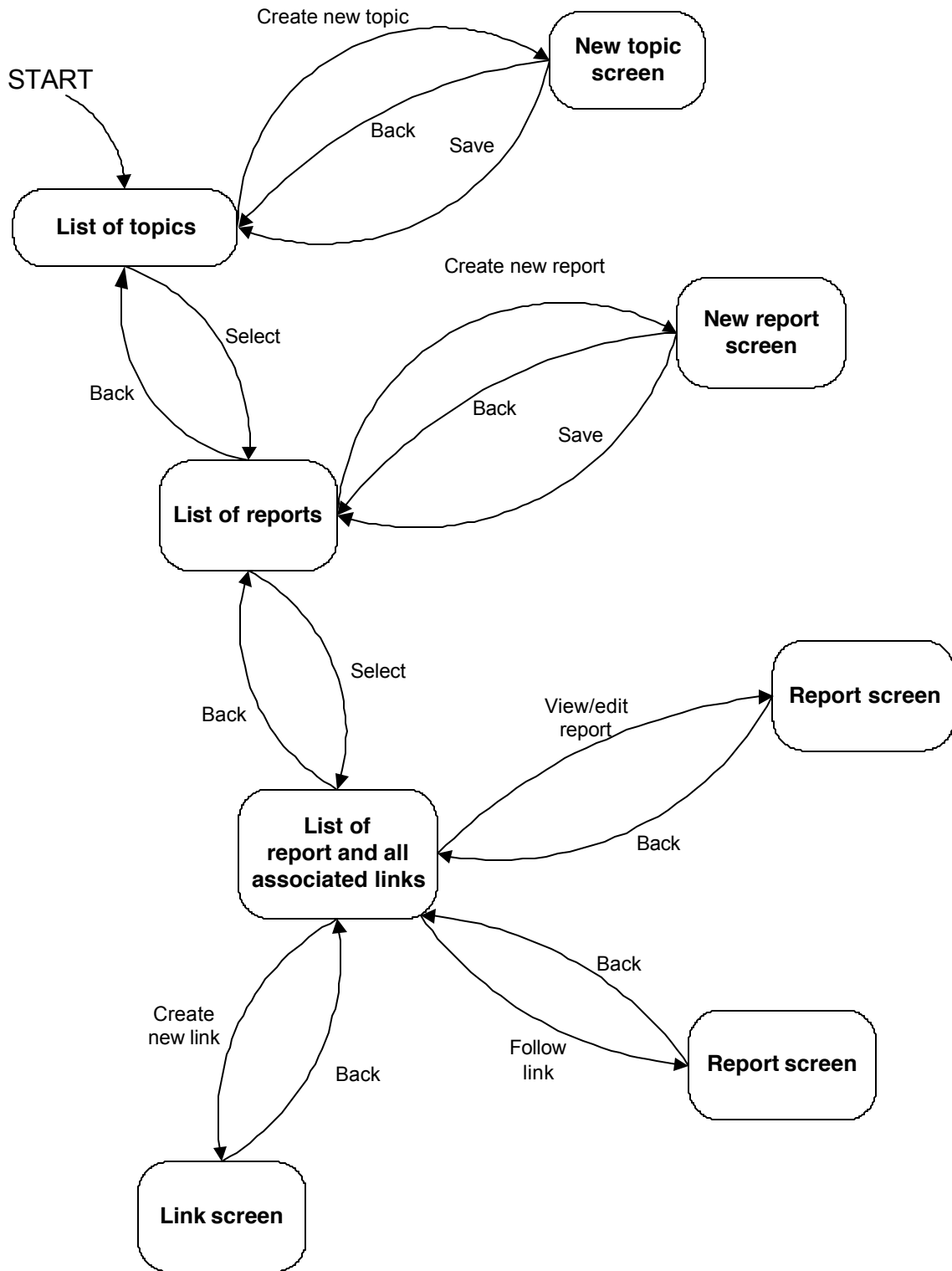
START

Create new topic

New topic screen

Back

Save

List of topics

Create new report

Select

Back

New report screen

Back

Save

List of reports

Select

Back

View/edit report

Report screen

Back

List of report and all associated links

Back

Create new link

Back

Follow link

Report screen

Link screen

Figure 3: Diagram showing all the states of the Clotho interface and the transitions between them.

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4.2 Implementation

4.2.1 Architecture

In the following section, we present the architecture of Clotho, seen from outside, in particular the relationship of the Clotho peers among themselves, across the Internet. Below is a overview of the different components playing a role in the peer-to-peer space of Clotho (Figure 4).
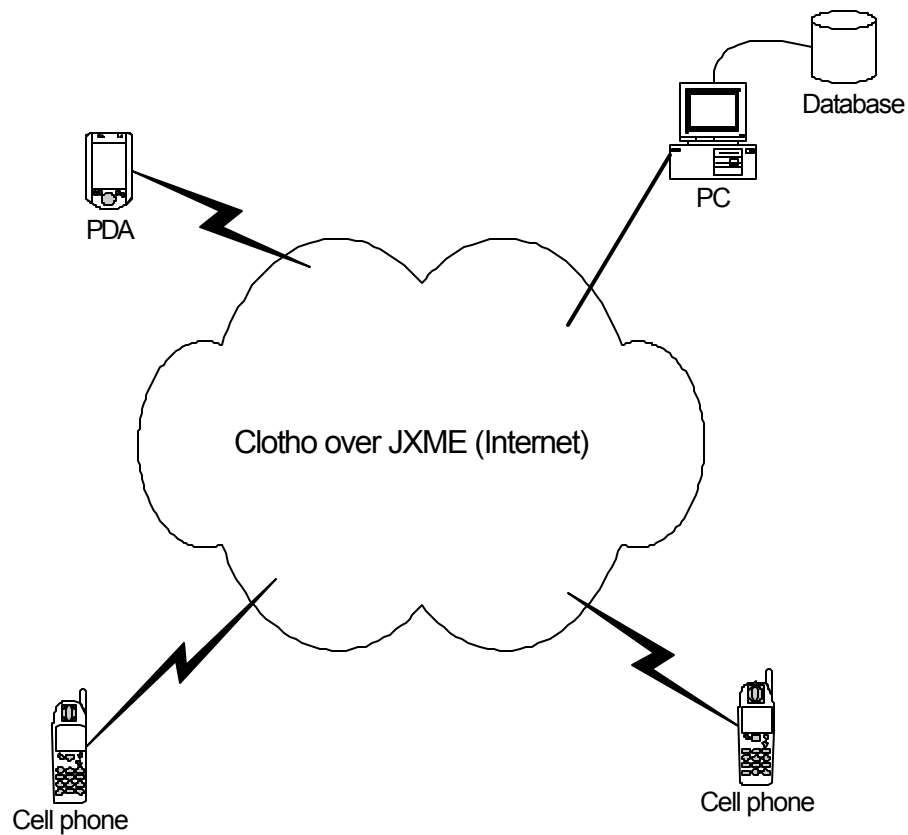
Figure 4: Diagram of components active in the Clotho peer-to-peer space.

Now that we have presented a general view of Clotho, we focus on the diagram of classes (Figure 5). This diagram shows the relationship between the classes constituting a Clotho peer.
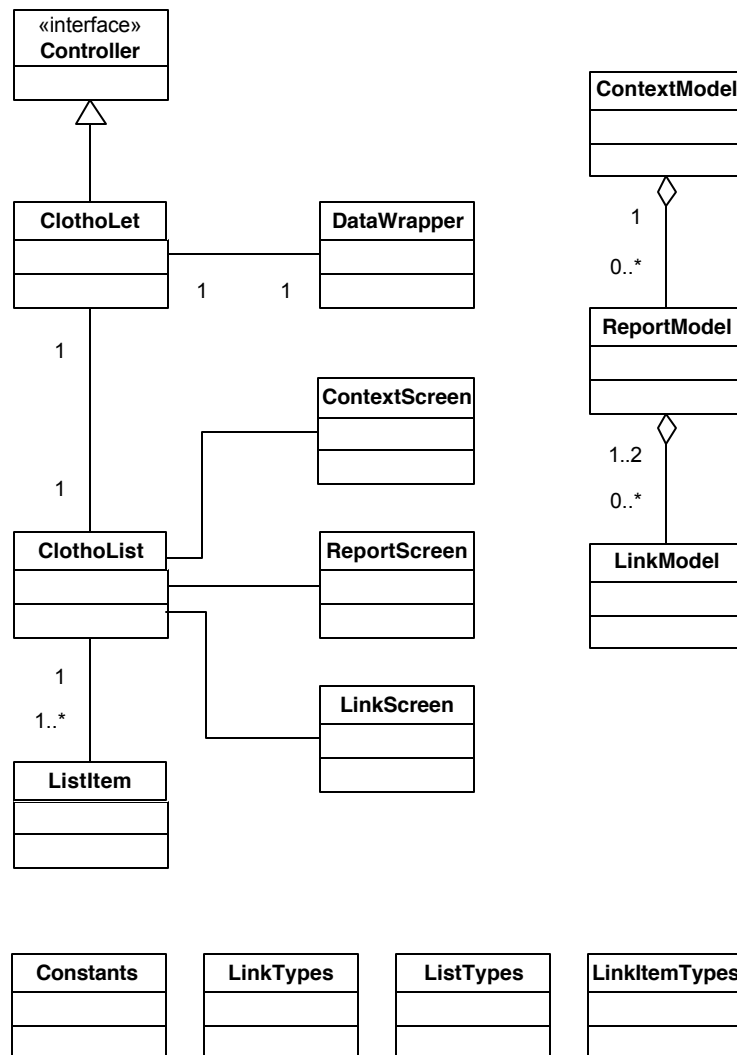
Figure 5: Diagram presenting the classes of Clotho and their relationship.

4.2.2 Interaction between peers

Now that the classes of Clotho have been introduced, here is a list of the messages occurring in the communication between the Clotho peers. These messages are involved in the replication process of the different data pieces, such as topics, reports and links.

Messages:

- •"addTopic": propagates a new topic to all peers
- •"addReport": propagates a new report to all peers
- •"addLink": propagates a new link to all peers
- •"retrieveEverything": requests a copy of all topics, reports and links. Called usually by a user who has just entered in Clotho.

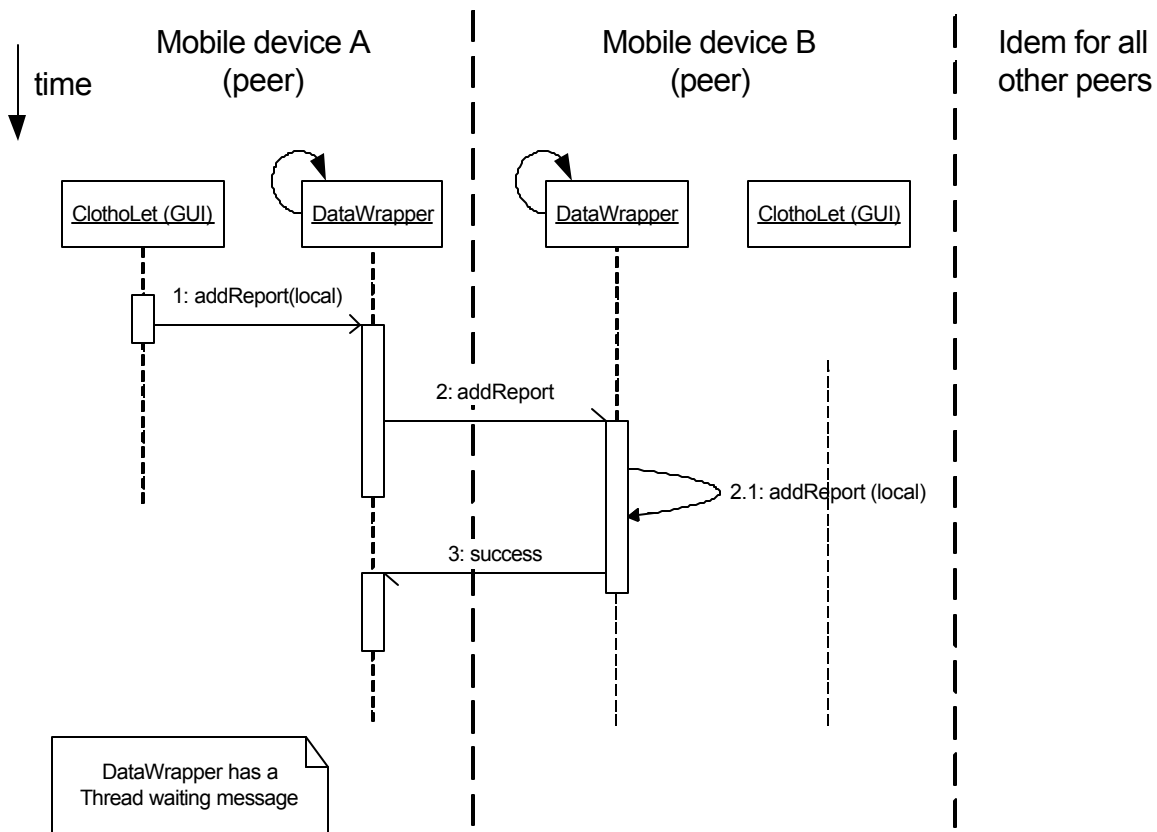Below we present the sequence diagram for the "addReport" message (Figure 6).

Figure 6: Diagram giving the sequence of the operations involved in the "addReport" message.

This sequence diagram shown in Figure 6 gives the sequence of the operations (local and remote) involved in the addReport() message. Those operations are responsible for the replication of a new report. When a user presses the Save button to save the report he just wrote, the method addReport() is invoked on the local DataWrapper object, which adds the report to the local storage and sends an addReport() message (asynchronous) containing the new report to the other peers (other wireless PDAs). The other peers DataWrapper objects receive the message, store the report in the local storage and return a success message (asynchronous) to confirm the reception of the addReport() message.

Summary

This chapter has presented Clotho from several point of views. First we have listed solutions to the drawbacks of field storytelling we observed in the existing community communication tool. Then we put forward the workings of the Clotho interface, tailored to the shortcomings of small devices. After having selected a set of supporting technologies, we present the Implementation part of the chapter which shows how Clotho was coded. We present this at three levels of detail using UML (Unified Modeling Language) diagrams [Booch 1999]: the diagram of components which presents the general elements of Clotho and how they inter-act, the diagram of classes, which gives the classes and the relations between them, and the sequence diagram, which details the different steps involved in the replication of report.

5.0 Evaluation

5.1 What were the conditions and procedures of the evaluation?

The purpose of the evaluation is to study the possibilities of Clotho and further-more obtain insights into the collaborative process of storytelling.

We invited three amateur journalists from a community online publication, initiated through the SilverStringers project at the MIT Media Lab to participate in the eval-uation. Their experience with storytelling suitably matches the context of a local community journalism.

Their task was to cover the open-house demos of the Digital Life consortium sponsors meeting, during which various groups demonstrate the results of their research.

To help the SilverStringers in this task, they were equipped with wireless devices loaded with the Clotho tool. These devices were to have provided an easy way to enter text.

Before starting, we gave them an introduction to the tool and a brief hands-on tutorial.

5.2 How the experiment unfolded?

On the day of the experiment, the two invited amateur journalists arrived.

We gave each of the participants, a Compaq iPAQ, a Windows CE based PDA equipped with 802.11b wireless card, loaded with the Clotho tool. This model is not featured with a keyboard, and its sub-par handwriting-recognition capabilities constitute a serious hindrance for text writing.

We ran a quick tutorial on Clotho and the device. The two participants did not encounter specific difficulties in using Clotho. To adjust to write on the device was the most troublesome part.

Once they felt ready to start their reporting task, they headed for the demos of the Digital Life event (see Figure 7). We followed them in their progression and took down notes.

Figure 7: Reporters at work

5.3 What did we observe?

The whole experiment lasted approximately two hours. We got five reports from one SilverStringer, six from the other. Three topics were created by the reporters. One reporter asked three questions, the other asked only one.
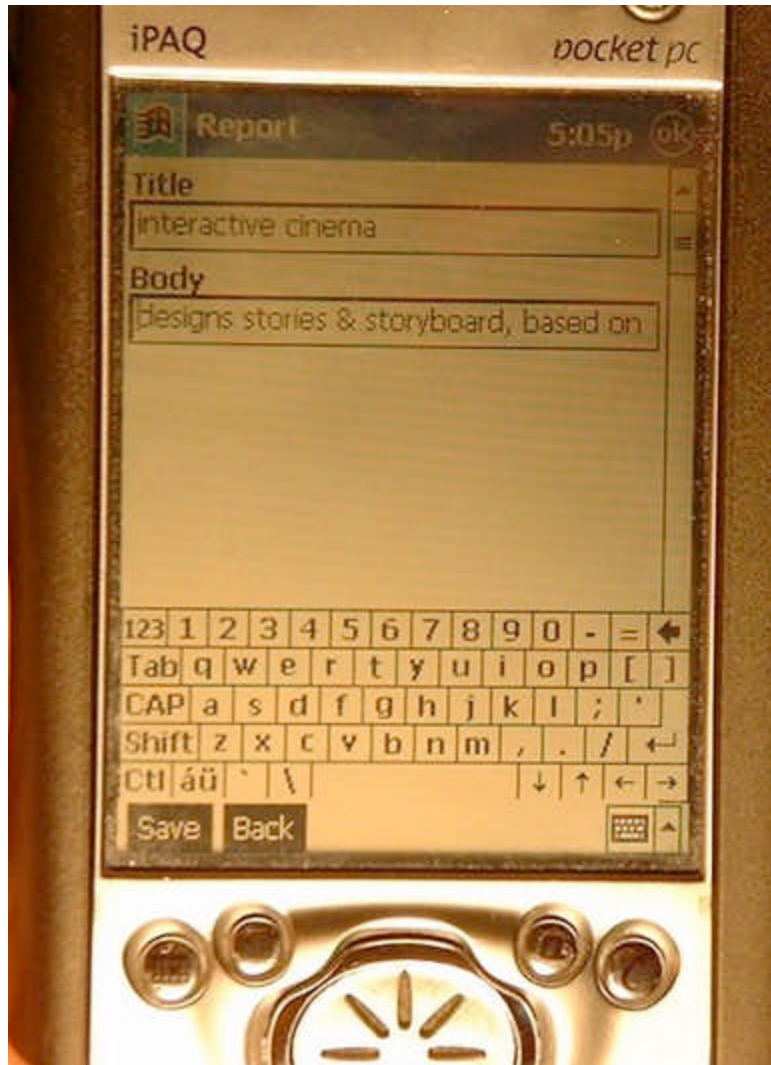

Figure 8: One of the reports shown on the iPAQ

The full text of the report (see Figure 8) titled 'interactive cinema' is "designs stories & storyboard, based on an author's ideas". The reports of another reporter

have a different style. Here is one (unedited):

"M studio

Plan stories wuth vudio clips

Shows animation on p c

Can show sourse

Xml"

As can be noticed, the style of the reports is terse and brief (without pithy comments), confirming that the writing process is made unwieldy due to the text-entry process. Furthermore, this limitation made the reading of the reports hard to understand. So the linking possibilities were restrained but have still been used. For example one of the reporters asked the following question using an "open link" (i.e., a link that does not yet point to anything): "hi, ask how fast his car goes".

The reporters also used the capability "open link" in a quite unexpected way. One reporter sent to the other the following message "where are you" (see Figure 9). This is very similar to an instant-messaging feature, which would be an interesting enhancement that could be easily added to Clotho.
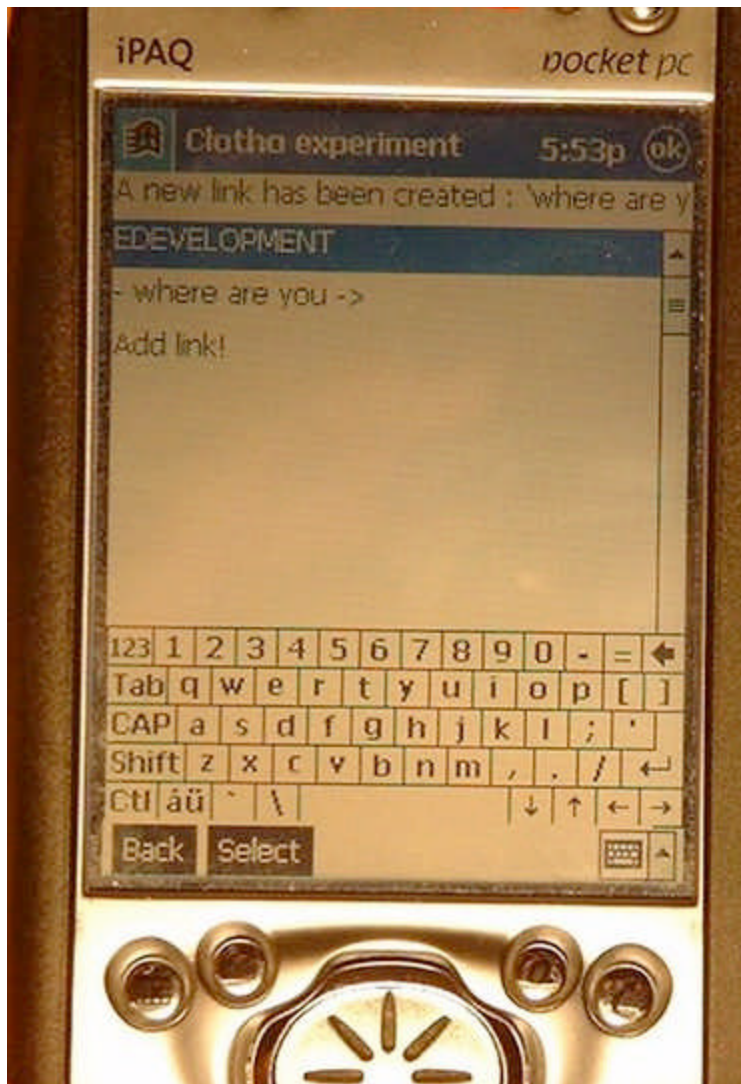
Figure 9: Instant messaging-style question

During our observation of the reporters, we noticed that the reporters seemed to have different approaches in using Clotho: one was jotting down notes as the demo was explained, while the other waited for the end, before writing his report.

After the experiment, we asked them their impressions. Their main comment concerned the difficulty of text entry. Both of them used the graphical keyboard, being not used to the handwriting recognition feature of iPAQ. For them, this seriously slowed them down in their reporting task. This also confirmed our observation of being split between writing their report during a demo or at the end. The large number of demos slowed them in the choice of the demos to report on. They appreciated the possibility of communicating at distance.

5.4 General comments

•The reporters were intrigued and interested by the possibilities that were offered to them to support their storytelling experience.

•The question feature through open links was well taken advantage of and even with an unexpected and very interesting twist in its primary goal: reporters used it as a way to communicate between each other. The linking between reports wasn't used in this case, evidently because of the large number of demos to be covered during the open house.

•It was noticed that the interface for typing is inappropriate. A real keyboard would be much preferable. The Handspring Treo or the Danger device would be more appropriate candidates for the experiment. Another interesting option would be to use an audio interface for Clotho. Enhancing Clotho with technologies such as VoiceXML, and adding intelligent marking of the audio files, would provide a plat-

form for field-reporting with a wider reach than the current version of Clotho, because it would be usable on any phone, even not wireless.

•While each has his own way to enter text, it must be stressed that the style of reports, terse or expansive, depends also on the technology for typing text in the device.

•A larger number of participants would have offered more opportunities to stimulate an exchange of comments and queries, and to confirm Clotho's value.

6.0 Conclusion

The purpose of Clotho is to provide storytellers with a platform which facilitates the gathering of widely disseminated stories in a meaningful structure of inter-linked stories, so that they can be readily accessed by all the members of the community. The relationships between stories constitutes the backbone of the structure. Any member of the community is allowed to establish those relation-ships.

Our solution to implement such an environment took its inspiration from the oldest way of disseminating information, the "grapevine". Nowadays, at the time of digital communications, there is a striking equivalent to this unorganized source of infor-mation: the peer-to-peer network. In this network, any peer plays the role of infor-mation relay, whereas the "grapevine" is restrained by the importance given by people (the potential "relays") to the piece of information they receive. Since our goal is to offer a platform that has timeliness, we implemented Clotho on mobile devices, which people carry with them most of the time.

In the theoretical discussion, we extended the four characteristics of communities proposed by McMillian [McMillan 1986], with the notions of '*Leverage*' and '*Visibility*'. A community that presents a strong image ('*Visibility*') of a united group to the human society it is part of, has a '*Leverage*' on the society. An example close to us, is the SilverStringers group of senior citizens, which was able to obtain Internet access from City Hall, because of the community activity.

After having studied several solutions, we chose to use JXTA, an open implementation of peer-to-peer technology, available on many platforms, including the mobile devices.

Making use of this infrastructure, we have built a platform for sharing among people, the stories and the relationships between them (links).

Although the conditions of the experiment were not optimal, our collaborative tool significantly enhances the field reporting of a group of amateur journalists by providing them with an organized and shared virtual "file cabinet". The preliminary results suggest that our hypothesis is worth pursuing.

The next step in this project would be to evaluate this tool with professional journalists. Because of their greater needs, one would have to add other features, such as the possibility to handle pictures and audio recordings.

Tables of figures and tables

Figures

Tables

Bibliography

[Berners-Lee 1998] Berners-Lee, Tim: Semantic Web Road Map: W3C Design Issues. URL http://www.w3.org/DesignIssues/Semantic.html, Oct. 1998.

[Booch et al. 1999] Booch, Grady; Rumbaugh, James; Jacobson, Ivar: The Unified Modeling Language User Guide, Addison-Wesley, 1999.

[Green 1999] Green, Stephen J.: Building Hypertext Links by Computing Semantic Similarity in IEEE Transactions on Knowledge and Data Engineering, Sept/Oct,1999.

[Khaldun 1969] Khaldun, Ibn: The Muqaddimah, translation by Franz Rosenthal, Princeton University Press, 1969.

[McMillan 1986] McMillan, D.W.; Chavis, D.M.: Sense of community: a definition and theory, Journal of Community Psychology, 14, 6-23, 1986.

[Oldenburg 1989] Oldenburg, Ray: The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Hair Salons, and Other Hangouts at the Heart of a Community, New York: Marlowe & Co, 1989.

[Putnam 1993] Putnam, Robert D.: The Prosperous Community" The American Prospect vol. 4 no. 13, March 21, 1993.

[Schuler 1994] Schuler, Doug: Community Networks: Building a New Participatory Medium. Communications of the ACM, January, 1994.

[Smith et al. 2000] Smith, Brian K.; Bender, Walter; Endter, Ingeborg; Driscoll, Jack; Turpeinen, Marko; Quan, Dennis: Silver Stringers and Junior Journalists: Active Information Producers. IBM Systems Journal, Vol. 39, Nos 3&4, 2000.