

# Towards An Ambient Desktop to Promote Workplace Awareness

Rod McCall<sup>1</sup>, Benoît Otjacques, Fernand Feltz  
Public Research Centre – Gabriel Lippmann  
41, Rue du Brill  
L-4422 Belvaux  
Luxembourg  
{mccall,otjacque,feltz}@lippmann.lu

**This paper describes a prototype system that displays synchronous workplace awareness information using the ambient technology paradigm. It focuses on making people aware of the nature and volume of interactions that have taken place within a workgroup. The visualisation uses simple graphics based on a maritime flags metaphor, is displayed in the Windows Active Desktop and is designed to be as non-intrusive as possible. The information used in the visualisation is drawn from a database which stores information about the type and frequency of interactions by the users of the co-operative environment. The system uses lightweight technologies and it should be easy to add features to support delivery of the information to standard client applications, smart boards, PDA's and mobile phones.**

*Workplace Awareness, CSCW, Visualisation, Ambient Paradigm*

## 1. INTRODUCTION

Many collaborative tools provide only basic information about the interactions of their users, with information typically being restricted to aspects such as online status (e.g. busy, online or away), how many emails remain unread or when the next meeting is due to take place. While such information is useful it provides only very rudimentary data about the nature and volume of interactions that are taking place. In contrast the work presented in this paper draws upon the experiences of participants within a European Network of Excellence (NoE) and discusses the development of an ambient visualisation (the Ambient Workplace or AW), which informs them about the nature and volume of activities. The objective of the system is to make the participants aware of current activities and to encourage greater participation.

Within projects such as NoE's, information is often shared through traditional means such as email, a web portal, or discussion groups. In many cases the web portal contains associated information such as news, forums or the mailing list archive. In order for people to assess what is new, or the level of activity they often have to break from their existing task and visit the project website, or a collaborative portal. In addition they may find themselves having to use specific tools to take part in discussions or share documents. Examples of such systems include Yahoo Groups or BSCW. Moreover if they wish to assess how active the project, or individual members are they may need to execute a series of search queries on their email or the forums and websites. All of these issues combine to make carrying out tasks which are non-core, e.g. finding out about the level of activity as opposed to writing that all important one hundred page EU deliverable, both difficult and undesirable.

This paper discusses the development of an ambient and ubiquitous visualisation that ensures people are kept aware of the nature and volume of interactions between entities in a co-operative environment. The objective is to provide non-core information in the background without forcing the user to attend to it or use a separate application. The paper contains background information about awareness and the Ambient Workplace, then describes the prototype system, future work and provides a conclusion.

## 2. BACKGROUND

The model and system developed in this paper rely on two concepts: entities and interactions. Entities are individuals, groups of co-workers (for example a research team), or resources such as documents, email or a shared calendar. Interactions are the actions involved in sharing information among entities, for example sending a document from one person to another.

Awareness is a critical aspect of many CSCW systems and is essential to the overall fluidity and naturalness of collaboration [1]. Ellis argued that 'the philosophy of groupware is to encourage cooperation by making it known and instantly apparent to all who is sharing what with whom' [2]. Awareness of the activities of others also helps to provide a context for one's own activity [3] and may help shape our activities. With this in mind the AW focuses on providing support for workplace awareness, rather than informal, social or group awareness (for a discussion and

---

<sup>1</sup> This work was carried out during the tenure of an ERCIM fellowship.

definitions of these types of awareness see [4]). Workplace awareness provides information on the identity of those in the workplace, their activities and location.

The AW visualises two kinds of workspace awareness, *Individual Awareness* (IA) and *Global Awareness* (GA). IA provides information about specific entities, for example an individual user or an organisation (i.e. another project partner); examples include the amount of interactions initiated by a specific entity or whether they are online. In contrast, GA provides aggregated or anonymous information about these entities. For example, GA would provide an overview of the number and type of interactions for the entire project, however it does not provide information about a specific person or group of people.

A number of indexes are used in order to calculate and display information relating to the quantity and nature of interactions with respect to GA. A summary is provided below and a more complete description can be found in Otjacques et. al. [5].

- Coopadex (electronic Cooperation Activity Composite Index). This value represents the mean quantity of computer-mediated interactions by members of a group over a given period of time.
- N-Coopidex (Normalized electronic Cooperation Interest Composite Index). This value represents the nature of the co-operation. It provides an indication as to the mean quality or nature of the interactions or more precisely the level of motivation the group members possess for interacting. It takes into account the nature of the task such as whether it is mandatory or optional, active or passive.
- Glocoopex (Global electronic Cooperation Composite Index). This is a global value which is a product of the Coopadex and N-Coopidex values.

The indexes take into account the nature of the interactions which have taken place, for example whether an interaction is active or passive. An active interaction is one you have specifically attended to, for example editing a forum post on a website. A passive interaction being one a person does not need to deliberately attend to, for example noticing that other people are logged into the website. Other categories used are whether the interaction is mandatory or optional, examples include whether a person must reply to an email from their manager or whether they can ignore the email about the office football team.

Although the system makes use of historical data in order to calculate the indexes, for example to calculate mean scores for a period of time, it provides up to date (or synchronous) information. For example a change to the level of activities will result in the visualisation being updated. In order to support GA, the system visualizes the current value of the indexes. Historical values may be valuable in some contexts but these go beyond the scope of this paper.

To support IA, the system draws on data from the entities which the user is monitoring. For instance, whether a user is online, whether a user has initiated interactions in a recent past or whether a given document has been updated.

### 3. INITIAL PROTOTYPE

#### 3.1 Design Rationale

The Ambient Workplace builds on the idea of peripheral awareness introduced by Heath and Luff [6]. It draws on a number of design principals outlined by Cadiz et. al. [7] which were used in the Sideshow system, namely:

- *Always present: the visualisations exist within standard applications such as email clients, word processors, instant messaging clients and the Windows Active Desktop. This should reduce the need for people to use specific applications in order to obtain awareness information.*
- *Minimize motion: none of the visualisations make use of data or animations with a high frequency of update.*
- *Make it personal: users will be able to customise what they view and other aspects, such as update time etc.*
- *Extensible: our definition is slightly different from that used by Cadiz et. al however plug-ins will be available for a range of standard client applications.*

Others such as making it scalable or supporting quick drill down are not quite as relevant in the context of this system. Cadiz et. al talk of scalability in the context of new sources of information becoming available (e.g. a news feed). With the AW the main changes to data are likely to be the availability of new flags or the addition of new users. Both of these are comparatively easy to handle. Drilldown is also not such a relevant issue as data is unlikely to be very hierarchical in nature, indeed the most complex drilldown required may be when a person wishes to open a document related to a specific entity, again this can be handled relatively easily.

### 3.2 Implementation

A prototype was developed (see figure 1) to explore the graphical metaphor (see section 3.3) and to test the underlying technologies. The system consists of three main components a server application which retrieves information from a database, a client on the user's PC which displays the visualisation in the Windows Active Desktop and a Jabber Instant Messaging server. The latter is used to control the user accounts (such as log in, presence and privacy information) as well as to send information to and from the client and server applications. The database stores the information about the nature and level of interactions, this is obtained from monitoring the mailing list, website and other sources.

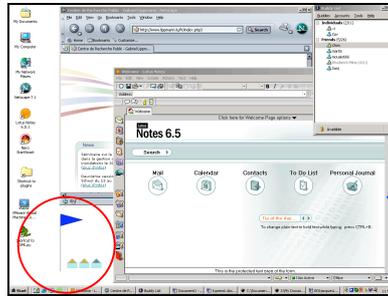


FIGURE 1: A screenshot illustrating the Ambient Workplace (lower left in circle)

### 3.3 Metaphor

The system uses representations that are based on maritime flags and beacons found on ships and around coastlines. The designs chosen draw upon the basics of the maritime flag metaphors, i.e. the use of different colours and shapes but do not use the same graphics. The metaphor was chosen as many people are familiar with the basic concepts of flags and beacons, and the representations used are comparatively simple. In keeping with the ambient paradigm the aim of the flags is not to distract the users, hence they change comparatively slowly and the amount of data contained in each representation is quite small. Hence once understood they should not require the user to spend a lot of time trying to interpret them. Indeed the intention is that they sit in the background and require almost no specific attention.

Global Awareness is represented by a blue flag (see figure 2). The colour of the flag provides an overview of the quantity and quality of the interactions (Glocoopex), with brighter blue indicating a higher value, and dark blue a lower value. The width of the flag represents a value relating to the use of the cooperation tools (Coopadex), and the height of the flag indicates the level of interest all users had with respect to the interactions (N-Coopadex). Note height relates to the vertical size of the flag, not its position on the flagpole.

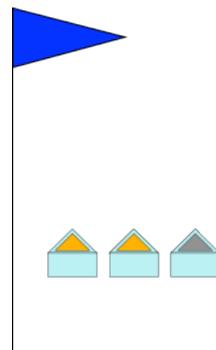


FIGURE 2: A picture of the Ambient Workplace. From the top left, the *Glocoopex* flag, the three beacons illustrating entities using the system

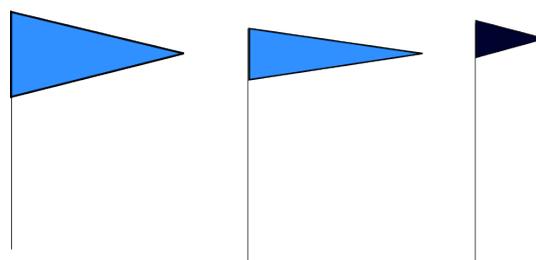


FIGURE 3: Three activity flags indicating the volume and type of interactions taking place within the system

The examples in figure 3 illustrate a number of scenarios based on the values of the *Glocoopex*, *Coopadex* and *N-Coopidex* values. The first flag (figure 3, left) illustrates that there has been a large amount of activity relative to the preset time period (the flag is bright blue), there has been a large amount of voluntary activity (the flag height is high) and there has been a large use of cooperation tools (as represented by the length of the flag). Figure 3 (centre) indicates a slight variation, with there being less interest in the interactions, as represented by the flag height and figure 3 (right) indicates there has been little in the way of voluntary activity and use of electronic cooperation tools. This is represented by the flag height being less, the colour being dark blue and the length of the flag being lower.



**FIGURE 4: The Entity Beacons, the further to the right (red) the more interactions or activities that entity has initiated**

Individual Awareness is represented by a set of beacons (see figure 4), with each beacon representing an individual or group of individuals (e.g. a project partner location). The coloured triangle indicates the number of computer-mediated interactions concerning that entity over a preset time period. Note that interactions include both active operations like sending an e-mail and passive operations like being updated for a shared resource. Grey indicates no interactions, orange some interactions and red many interactions. At this stage the values are preset, however they can be changed or in future set by the user. When a user or group is online the border of the triangular area will become green (this is not currently implemented or illustrated). This feature only applies to entities that can initiate some interactions (i.e. 'users').

#### 4. CURRENT WORK AND FUTURE DIRECTIONS

An extensive study is currently ongoing with the objective of improving the design of the visualisation. During the first phase around twenty participants (some being potential users) took part and they were asked to draw a series of visualisations using the flags and beacons. A second phase will involve a focus group who will create a shortlist of their preferred designs and if necessary improve them. The third phase will involve as many members of the NoE as possible selecting from the short list which designs they would like to see implemented in the system. The remaining testing will become an iterative process where a series of live prototypes will be developed, evaluated and improved.

As the system develops new features will be added, such as the ability to click on parts of the visualisation to display the relevant data or application. Other features such as visualisations representing the status of email and the news forums will also be added. The intention is also to implement all or part of the visualisation in other client applications, on mobile phones and on smart boards.

#### 5. CONCLUSION

This paper has discussed the development of a system to promote workplace awareness. The system uses the ambient technology paradigm to deliver non-core information to users, with the objective that they can obtain the information without interrupting their normal working patterns. An early working prototype has been developed to explore the underlying ideas such as using the Windows Active Desktop to display information and the maritime flags metaphor. Further work is planned to refine the design of the flags and to add new features.

#### REFERENCES

[1] Gutwin, C. and Greenberg, S. (1999) The effects of Workspace Awareness Support on the Usability of Real-Time Distributed Groupware. *ACM Transactions on Computer-Human Interaction*, Vol. 6, N° 3, pp.~243-281.

[2] Ellis, C. (1995) Keepers, Synchronizers, Communicators and Agents. *ACM SIGOIS Bulletin*, Vol. 15, N° 3, pp.~10-14.

[3] Dourish, P. and Belloti, V. (1992) Awareness and coordination in shared workspaces. *Proceedings of CSCW'92*. Toronto, Canada, October 31 – 4 November, pp.~107-114. ACM, New York.

[4] Greenberg, S., Gutwin, C., and Cockburn, A. (1996) Awareness Through Fisheye Views in Relaxed-WYSIWIS Groupware. *Proceedings of Graphics Interface Conference 1996*, Toronto, Canada, May 22-24.

[5] Otjacques, B., Noirhomme M., Figueiredo, J., and Feltz, F. (2006), Composite Indexes as Metrics of Cooperative Activity. *Proceedings of AIM 2006*, Luxembourg, June 7-9.

[6] Heath, C. and Luff, P. (1991) Collaborative activity and technological design: task coordination in London Underground control rooms. *Proceedings of ECSCW'91*, Amsterdam, The Netherlands, September 24-27, pp.~65-80.

[7] Cadiz, JJ., Venolia, G., Janke, G. and Gupta, A. (2002) Designing and Deploying and Information Awareness Interface. *Proceedings of CSCW'02*. New Orleans, LO, 16-20 November, pp.~314–323. ACM, New York.