Lifestreams: An Alternative to the Desktop Metaphor

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ABSTRACT

We contend that managing one's own electronic world can be a frustrating task for most computer users, requiring too many separate applications, too many file transfers and format translations, the invention of too many pointless names and the construction of organizational hierarchies that too quickly become obsolete. What is needed is a metaphor and system for organizing the electronic "bits of paper" we all so easily collect, whether we create them ourselves or they come to us in the form of email, downloaded images, web pages, or scheduling reminders. Lifestreams is such a system.

BASIC MODEL

Lifestreams uses a simple organizational metaphor, a time-ordered stream of documents, to replace conventional files and directories [3, 4]. *Stream filters* and software agents are used to organize, locate, summarize and monitor incoming information. Lifestreams subsumes many separate desktop applications to accomplish the most common communication, scheduling, and search and retrieval tasks; yet its machine-independent, client-server architecture is *open* so that users can continue to use the document types, and viewers & editors they are accustomed to.

A *lifestream* is a time-ordered stream of documents that functions as a diary of your electronic life; every document you create is stored in your lifestream, as are the documents other people send you. The tail of your stream contains documents from the past, perhaps starting with your electronic birth certificate. Moving away from the tail and toward the present, your stream contains more recent documents such as papers in progress or the latest electronic mail you've received—other documents, such as pictures, correspondence, bills, movies, voice mail and software are stored in between. Moving beyond the present and into the future, the stream contains documents you *will* need: reminders, your calendar items, and to-do lists.

WHY LIFESTREAMS?

Studies [6, 1, 7, 2, 8] have shown that users of common desktop systems have difficulty:

- Organizing and finding information within hierarchical file systems.
- Making use of archived information, which users normally discard so that they are not overwhelmed by it.
- Getting a "big picture" view.
- Managing schedules and reminders.

Lifestreams provides a metaphor for organizing the electronic documents we all so easily collect—whether they come to us in the form of electronic mail, downloaded images, pages gathered from the Web, or scheduling reminders—in a fluid and natural way that reflects the way users work.

THE LIFESTREAMS INTERFACE

The Lifestreams interface is presented in Figure 1, showing a stream of documents. The user can slide the mouse pointer over the document representations to "glance" at each document, or use the scroll bar in the lower left-hand corner to roll themselves back into the past.
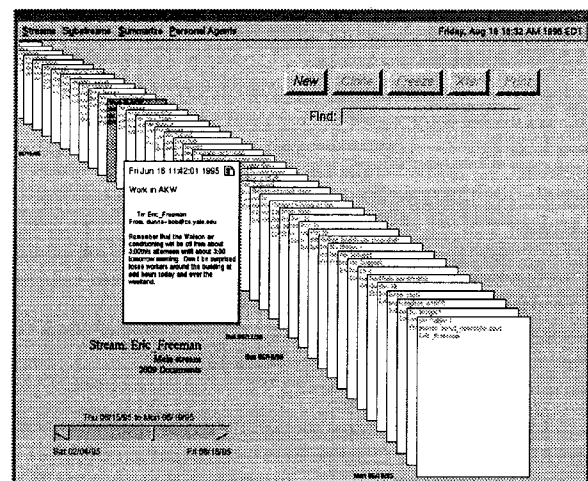

Figure 1: The Lifestreams Interface.

Color and animation indicate important document features. The borders of unread documents are colored red, the borders of writable documents made thicker and open documents are offset to the side to indicate they are being edited. Incoming documents slide in from the left side to alert the user, and newly created documents pop down from the top and push the stream backwards by one document into the past. In this way documents

are eventually moved out of view and archived automatically.

Users interact with Lifestreams via five primary operations: `new`, `clone`, `transfer`, `find` and `summary`. `New` and `clone` create documents. `New` creates an empty document and adds it to your stream. `Clone` duplicates an existing document. `Transfer` copies a document from your stream to someone else's. `Find` prompts the user for a search query and creates a *substream*.

"Substreaming" provides an organizational framework and an inexpensive way of finding information. Substreams, like virtual directories [5], present the user with a "view" of a document collection, in our case, all the documents that are relevant to a search query. Substreams differ from conventional directory systems in that, rather than placing documents into fixed, file & folder directory structures, they create virtual organizations of documents from the stream. Documents are not actually stored in the substream; the substream is a temporary collection of documents that already exist on the stream. Two substreams may overlap. Moreover, substreams can be created and destroyed on the fly without affecting the organization provided by the stream or any existing substream. Substreams are dynamic. If you allow a substream to persist, it will collect new documents that match your search criteria as they are added to your stream. For example, a substream created with the query "find all documents created by other people" would subsume your mailbox and automatically collect mail as it arrives. A substream created from "all electronic mail I haven't responded to" would act as a mailbox that only contains unanswered mail. Substreams can be created incrementally, yielding a nested set of menus. Semantically, this incremental substreaming amounts to a boolean **and** of each new query with the previous substream's query.

Menus are used to choose among existing substreams, create summaries and reset the "time" system clock into the past or future. The `summary` operation allows users to distill the information in a large number of similar documents into a single overview by taking a substream and compressing it into an overview document. The content of the overview depends on the type of documents in the substream. For instance, if the substream contains the daily closing prices of all the stocks and mutual funds in your investment portfolio, the overview document may contain a chart displaying the historical performance of your securities along with your net worth. If the substream contains a list of tasks you need to complete, the overview document might display a prioritized "to-do" list.

By default Lifestreams presents the user with a view of the stream from the present receding into the past. A lifestream also contains a future portion which is accessible but usually hidden. The interface contains a clock that displays the current time, which may be temporarily reset to the future to observe the future part of the stream. While in the future, users can deposit notes that act as reminders. When the clock is reset to the present these notes are once again hidden, however they arrive on the stream at the appropriate time to remind the user.

CONCLUSION

Computer users must deal with a far greater quantity and range of electronic objects in their work and personal lives than ever before. Desktop systems are inadequate for the task; new systems must support the management of these objects efficiently and transparently.

The success of Lotus Notes, and the transition in operating systems toward a document-centric model (thus OLE and OpenDoc) suggests that documents are now the sun around which applications revolve. Lifestreams takes this world a step further: It embodies in software the stream of electronic events already facing the user, and brings in applications (filters, summaries, agents, etc.) as needed. Lifestreams replaces the desktop metaphor with a more fluid and natural system that reflects the way users work.

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