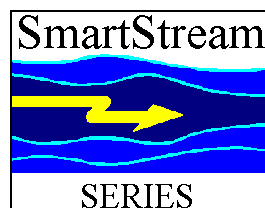


WORKFLOW TECHNOLOGY

A DISCUSSION PAPER



D & B SOFTWARE

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Summary

In the past few years, organizations have invested millions of dollars in new network infrastructures to enable client/server computing. Now they are investigating a new type of application to take advantage of these new technologies — workflow.

"If you haven't seen or heard about it yet, get ready for the word 'workflow.'"

Jim Carroll, J. A. Carroll Consulting

"It is very difficult to look at improving the business process without automating the workflow."

Collette Coad, Ernst & Young

"Within the next five years, there won't be a major information system without workflow."

John Clarry, Logicon Inc.

What is workflow? Why has its need arisen in the past few years? How can it affect the way you do business? What kind of workflow is best for your business? And how does SmartStream, D&B Software's business application software, use workflow to enhance your productivity? This discussion paper attempts to answer these questions.

There are tangible benefits to be derived from workflow technology. It enables organizations who undertake business process redesign — a procedure that analyzes the current business process and eliminates steps to make the organization more efficient — to automate the business process by breaking it into discrete tasks and sending each task to a worker within the flow for processing. It can also automate the flow of information throughout the entire enterprise, while integrating individuals' roles and functions.

The future for workflow holds great potential. D&B Software's SmartStream uses workflow in its transaction processing applications (Financial Stream, HR Stream, Manufacturing Stream, and Distribution

Stream). Its workflow implementation aids users as they perform standardized business activities or use automated task handlers.

Workflow Technology

Introduction

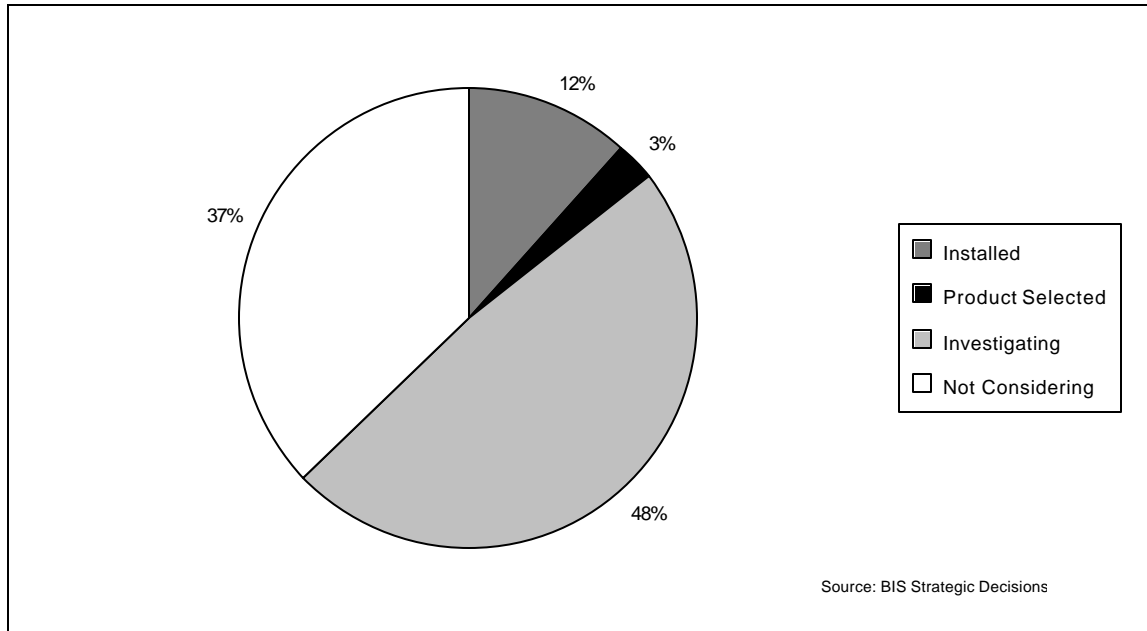
According to Forrester Research, workflow is "automating the transfer of information to support the flow of work." Workflow empowers managers to change their business process and place it under the control of software. Formerly, if an organization wanted to redesign a process without software support, it would have to build or purchase new software. Today workflow eliminates this problem by reordering and formalizing the business process through software. As processes change through time — as they invariably do — you do not have to reprogram or buy new software.

The term "flow" can refer to two things when discussing workflow. Depending on context, it can either refer to the flow of information from person to person, or to the flow of activities to be done, each of which is assigned to a specific user within the workflow. In some situations, it can refer to both sending the task *and* associated information to the worker.

Why workflow? In most organizations, paper information moves from desk to desk, awaiting approval. It is not uncommon for a document to be delayed for days. According to the Delphi Consulting Group Inc., the transfer of paper-based information may take up to 90% of the time in the entire process. Workflow makes the movement of documents or tasks from desk to desk automatic, correctly routing the information to the next person without human intervention. Because delays are minimized, processes speed up (increasing customer satisfaction), and cost savings are realized, due to an increased efficiency. If a new market opportunity arises or a business restructures, an organization can use workflow to respond quickly and redesign their business process.

The market for workflow is ripe. According to a survey conducted by the Delphi Consulting Group, seven out of every 10 companies plans to evaluate workflow products in 1993.

The following figure shows the results of a survey by BIS Strategic Decisions, which uncovered similar statistics. (Note that the businesses not considering workflow were information systems [IS] companies, who are inclined to reject the technology.)



Status of Workflow Software

Types of Workflow

One way to analyze workflow is to categorize it. Workflow is divided according to level of complexity, flexibility, purpose, and structure. Most industry analysts maintain that there are three types: production, administrative, and ad hoc.

Production Workflow

Production workflow involves complex, highly structured processing activities, such as loan applications, engineering change orders, product development, and insurance claims. Many applications in this category involve tasks that fit a standard pattern common to a particular document type, such as insurance claims or invoices. Production workflow is *task-driven*. Activity-driven workflow can involve the same people who repeatedly perform the same tasks, sending work to the next person in the flow for approval or processing. Production workflow is enterprise-wide; that is, it is driven by repeated customer interaction and must be continually refined and updated as new needs arise.

Administrative Workflow

Administrative workflow involves simple, form-intensive tasks like check requests, purchase orders, and personnel procedures. A typical administrative workflow procedure might be a new hire procedure that

directs personnel to provide a new employee with a computer, set up a phone mail account, and assign an electronic mail user ID. Administrative workflow typically uses E-mail as a conduit because it can be distributed across multiple locations. Its main purpose is to automate the approval cycle and route forms to the appropriate person. Because of its relative simplicity, an administrative workflow system does not require frequent modifications. It is also typically used to process in-house work, rarely interacting with customers or other companies.

Ad Hoc Workflow

Ad hoc workflow is comprised of repetitive, unstructured processes that may involve different white-collar professionals with each transaction. Typical ad hoc workflow processes are product documentation, sales proposals, receivables assessments, and product evaluations. For example, an ad hoc workflow team may be set up across departments to assess company-wide downsizing. Because of its lack of structure, ad hoc workflow is often confused with groupware, a workflow predecessor. (See the next section "What Workflow is Not.")

What Workflow Is Not

Because workflow is such a new technology, there is much debate within the information technology industry about its exact nature. The following three technologies are often confused with workflow.

E-Mail

Because E-mail is the conduit for workflow processes, people often confuse a sophisticated E-mail product like Lotus cc:mail with workflow. Yet E-mail products simply move messages across a network. They do not have sophisticated data management tools for storing large volumes of information, nor the intelligence to route an activity to the appropriate next person in the flow. According to Ken Norland of Distributed Systems Solutions International, "[E-mail] is too weak a model for extensive tracking and auditing of processes and can't handle digital signatures or decryption."

Groupware

Groupware refers to any application that allows users to share information within a group. Its objective is to improve the efficiency and productivity of collaborative workers through shared electronic resources, such as a

common database. Lotus Notes uses groupware technology, as do other document managing and scheduling products. Groupware lacks the intelligent routing of activities and documents that workflow uses within a business process. In addition, workflow is closely linked to the inherent business processes of an entire enterprise, not just those of a collaborative group.

Image systems

Image systems capture, store, and retrieve digital representations of hardcopy images. While some of these systems can route their images across networks, they are often closed and proprietary. Typically an image system is incorporated *into* workflow. For example, some image systems can link an accounts payable form to a scanned invoice residing on an optical disc. The accounts payable clerk processes the invoice, then sends the two linked documents to the next person in the flow.

Workflow Enablers

"The advent of networking allows corporations to use computers for more than individual productivity gains. Software can now make groups of workers more efficient." Alan Rodgers, Lotus Development Corporation

What technologies have arisen in the past few years that have made workflow possible? This section describes four workflow technology enablers: networks, E-mail, relational databases and optical storage, and graphical user interfaces (GUI).

Networks

In the past few years, networks have proliferated throughout companies. Because they offer users wider bandwidth and improved cabling, users can send more data from servers to PCs and send it faster. Smarter routers offer such features as protocol conversion, while bridges and gateways allow wider connectivity. This means that users can access data in relational databases on servers as fast as they used to be able to access it on mainframes. During workflow, data now moves from desk-to-desk quickly, enhancing response rates and speeding up business transactions. Since workflow operates on LANs, it can link together employees who perform tasks within the business flow.

Databases

Advances in relational database technology enhance both groupware and workflow. In addition, computer chip technology has improved so that users can run relational databases off a PC or server. Centralized databases can operate as workflow tracking repositories, helping members in the flow answer questions like "Where is the work now?" "What has been done so far?" and "What remains to be done?" Such central information databases can be updated by all individual workflow processing events and referenced as needed. They can also store information necessary to be processed, based on a previous step that was generated in a workflow activity. In addition, database systems like Sybase and Oracle can handle binary large objects (BLOB) like video or voice files, which can be embedded within workflow E-mail. With the advent of optical storage, large image files such as an organization's invoices for a year, can be stored on optical discs and accessed.

E-Mail

According to the IDC white paper "Electronic Mail: the New Corporate Backbone," E-mail "will play a fundamental role in workflow automation by providing the infrastructure for transport of the work packages." Some E-mail systems provide the ability to attach files to mail messages and send them to the next person in the flow for processing. This means that employees can route forms and other documents, as well as send messages, notifying each other to execute the next task in the flow.

User Interface

In the past several years, there have been great advances in the standardization of user interfaces with IBM's Common User Access (CUA) specification, along with the popularity of Microsoft Windows and the Apple Macintosh. The user interface is now the primary means of user interaction with the system.

A user interface must ensure that users can consistently navigate through the various components of a system. Traditional applications (whether based on a graphical user interface or not) often used the *menu* metaphor for navigation. This required the user have a basic knowledge of the system to know where he was going and what to look for. Such an interface is not well-suited for workflow systems.

The interface must be task or activity-driven. The user must be made aware of what tasks are expected. The system must not only automatically bring them to the necessary panel or screen to complete the task, but also

present the necessary information to complete the task. A user interacting with a workflow system requires more than a rudimentary alert signal to notify them when a workflow task needs attention. It's an inefficient use of workflow to require the users to locate information needed to take an action, and *then* maneuver elsewhere to complete the task

What Users Want from Workflow

Although workflow products are still new in the marketplace, many organizations have clearly stated what they expect from them. Information systems managers and business managers are looking for significant return on their IS investments by greatly improving the efficiency in their organizations, using workflow technology.

Business Process Redesign and Reengineering

In order to implement workflow, an organization must have a clear understanding of its business processes. When it starts examining ways to improve its processes, it is usually faced with two choices: either reengineer the entire business process or redesign it incrementally. What is the difference between business process redesign and reengineering?

In general, business reengineering involves analyzing how an organization works and how it can work better. It is a radical process, forcing managers to ask fundamental questions about their business, such as why it performs particular activities in a certain way. When fully implemented, it strips away previously implemented processes and starts business fresh -- in other words, from a blank slate. However, it is not recommended.

Reengineering a business workflow is problematic because its results cannot be predicted through analysis alone. Most companies have found workflow operates best when the business process evolves, rather than changes in one reorganizational sweep. That way managers and workflow designers can apply workflow to the daily experience of doing business.

The low-risk way to implement workflow is through business process redesign, or business mapping.

As its name suggests, business mapping maps the business process into the software. Unlike business reengineering, it is a subtle procedure that analyzes the current business process and eliminates steps to make the organization more efficient. It realizes that most departments operate cross-functionally, that sales, marketing, and development are not separate domains, but integrated parts of the whole. Like pieces in a puzzle, they must all link together in order to sell a product or provide a service.

Business process redesign produces dramatic results because it

- Eliminates unnecessary work
- Provides individuals at all organizational levels with the information necessary to make on-the-spot decisions or take action
- Focusses on results rather than tasks.

Additional User Considerations

Among other customer demands for workflow are the following:

- *Easy installation and configuration.* Users want a workflow product they can install without needing months of arduous program development and study. Surveys have shown that they prefer an incremental approach that involves business process redesign rather than extensive reengineering. (See the following section.)
- *Flexibility.* Users want to be involved in designing the workflow process themselves, so they will know how to modify it as business processes evolve. To accomplish this task, they are demanding easy-to-use graphic tools so that non-technical people can change -- and possibly even design -- workflow applications.
- *Exception handling.* Users are demanding that workflow software allow exceptions to be programmed into the flow. For example, what happens if a crucial member of the flow is on a two-week vacation? Sophisticated exception-handling should allow the administrator to program an alternate recipient while the employee is away.

Exception handling could also allow users to program their own exceptions in the middle of the workflow, ones that may have not been anticipated by the application developer. The ability to add processing steps with intricate branching will clearly distinguish a robust workflow product from a less flexible one.

- *Integration with known tools.* Finally, users want workflow products to be integrated with tools that they have been using within their organizations.

Benefits of Workflow

Although in its infancy, workflow is already providing benefits for its users. To see how the workflow approach offers a significant advantage over traditional transaction processing methods, it is useful to discuss how transactions processing has traditionally been done.

How it Used to be Done

In the past, most transaction processing applications were reactive, recording business activities that had already occurred. Most of the work effort was involved in capturing and validating data. Software application developers provided systems that gave customers only two ways to implement applications:

- Change the way they do business to reflect the way the applications support business activities. To avoid added development costs, a company had to adapt its business to how the application supported the business flow.
- Modify the application to reflect the way the company conducts its business. This implementation required that the business continually "reinvent the wheel," customizing the software with each new release of the software.

Many non-workflow applications today are difficult to learn and use. For example, employees must first be trained how to navigate the many screens of a typical financial application. To enter an invoice, they must follow many steps, moving back and forth between screens. Procedure manuals are often complex and hard to follow. By their nature, they had to not only describe system usage, but also the business rules surrounding processes.

In contrast, workflow applications are task and event-driven. The average user does not need to learn complex navigation steps, nor be extensively trained on procedural details surrounding their system interaction as it relates to the organization's business procedures.

To summarize, non-workflow applications do not add value by *performing the work*, nor have they been *pro-active* in how they address business problems.

How it Can Be Done Now

Workflow automation applications move the computer system into the middle of the business activity, automating users' interaction with applications. They eliminate non-productive activities and efficiently process others.

If your organization plans to undertake business process redesign whereby process steps will be eliminated or automated, workflow technology can help you in the following ways:

- They can automate the flow of information throughout the entire enterprise.
- They can integrate individuals and their roles and functions.
- They can easily be tailored to model the individual's work style and decision-making. Users only need to deal with the task at hand.
- They can formalize business procedures within your system. They do this by providing workflow tools that manage these procedures. This means you can control and audit your business processes more effectively.

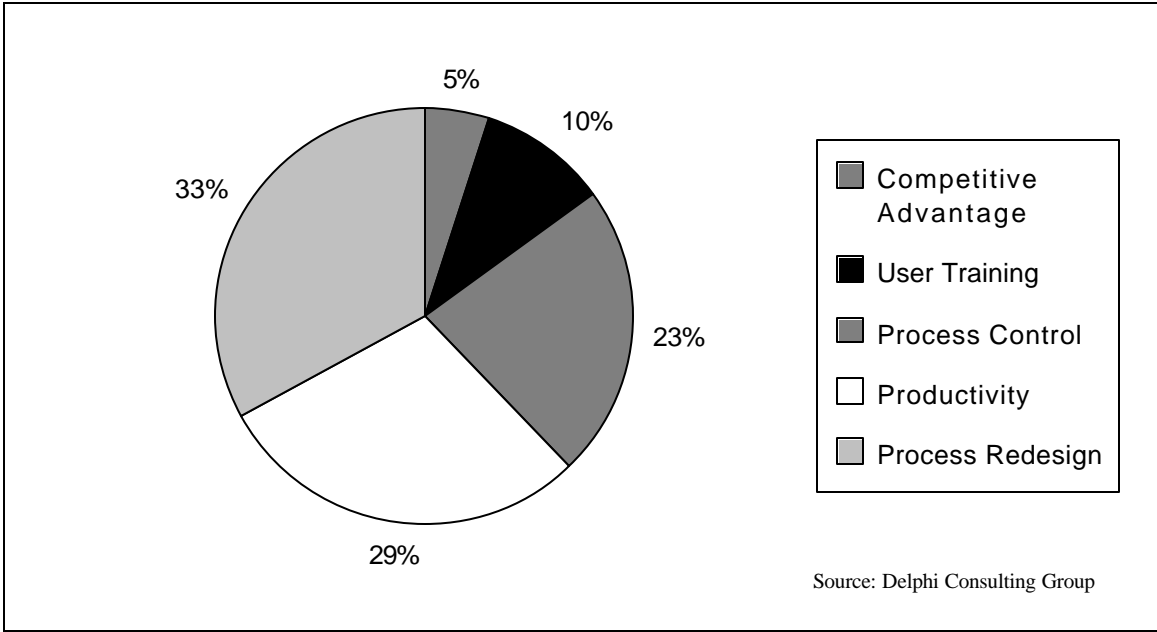
Because they eliminate non-productive activities and efficiently process others, workflow applications fundamentally alter the way people work. They model the work style of each individual in the flow, bringing users the right information at the right time without them having to manually or mentally link it.

Workflow automation is *event-driven*. An event can be any task that a worker executes, such as reviewing purchase orders or approving schedules. When events take place, workflow automation anticipates the next step and knows how to route one worker's completed task to the next worker in the flow, along with the associated information necessary to complete this task. Because this routing happens automatically, it is less error-prone than manual redirection, or reliance on paper-based business procedures.

Automated workflow application design can help companies re-engineer their business flows, enabling their organization to perform and execute tasks in the most efficient manner.

After implementing workflow, some companies are reporting productivity gains from 20 to 50% -- and with *less* staff.

The following figure shows how customers view the perceived benefits of implementing workflow.



Perceived Workflow Benefits

SmartStream and Workflow

The SmartStream environment is the vehicle by which D&B Software provides automated workflow management for its enterprise-wide business applications. It helps eliminate manual procedures while automating the business flow to the next step; as a result, it simplifies communication and shortens lead times. It is business activity oriented with a focus on automating repetitive processes

The following sections describe the workflow environment and provide an introduction to SmartStream's main workflow tools: Activity Manager and Workflow Workbench, and SmartStream Agents.

SmartStream's Workflow Environment

The SmartStream environment —specifically the Activity Manager facility within SmartStream — is the vehicle by which D & B Software provides automated workflow management for the new SmartStream series of enterprise-wide business applications.

To varying degrees, all organizations follow processes to support their day to day business activity. Typically, the larger the organization (such as a government agency) the more complex these rules and processes can be. Formal controls may be put in place to ensure integrity of information or to provide proper accounting and audit controls. Traditionally, these controls and procedures have often been documented manually, such as with procedures manuals. Because they are paper based, they are passive. They are not flexible enough to react to the many exceptions that may occur in day-to-day activity. Organizations often have to issue strict guidelines and dictums that their employees must follow. The rules themselves may be so complicated (for example, procedures related to information system interactions) that a staff of internal auditors may be necessary.

If your organization undertakes business process redesign, which may involve the elimination of manual steps, it requires a tool that can

- Provide facilities to embed the processing steps in a sequence as part of the information system. This enables you to better control and manage the execution of these steps.

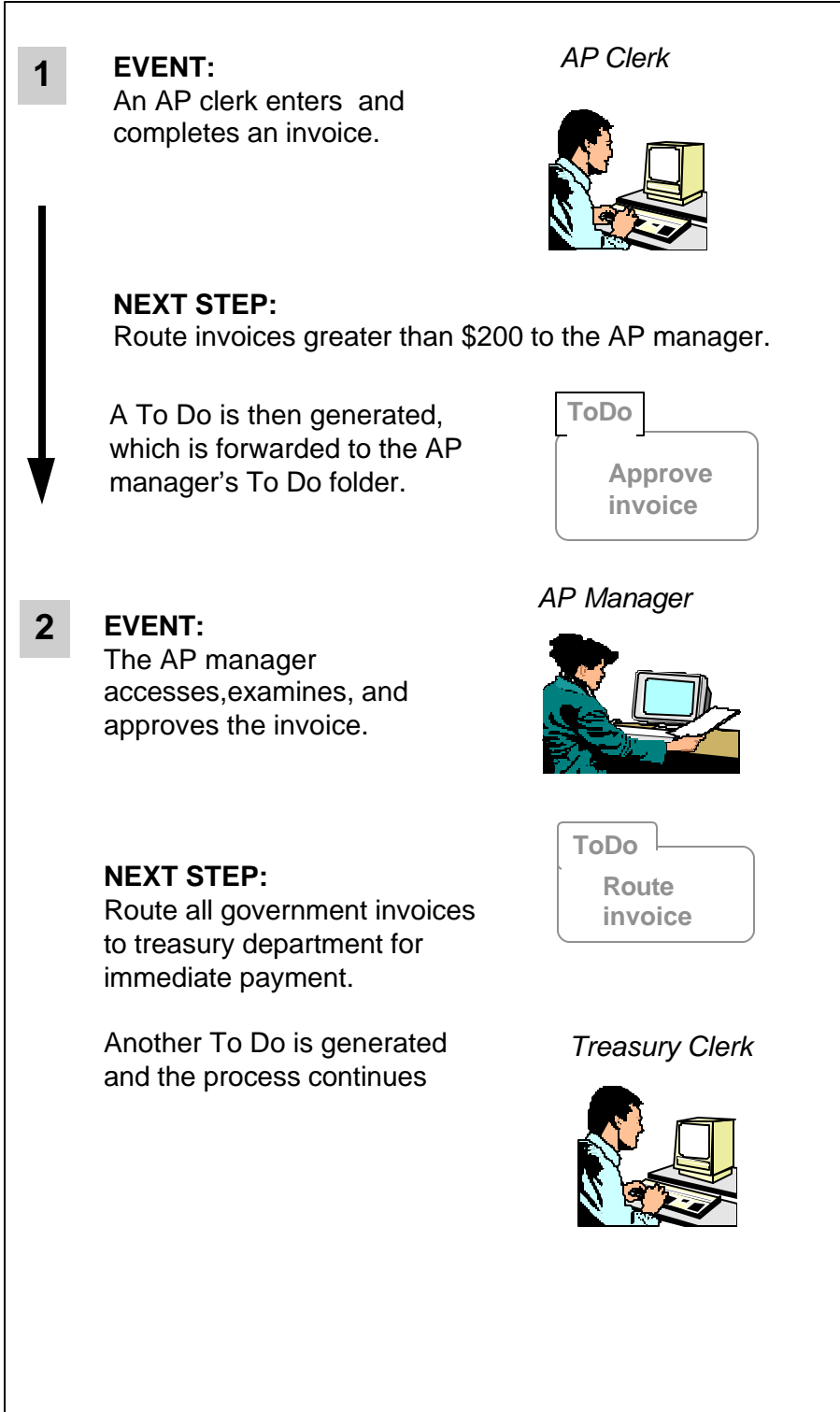
- Provide facilities to route the tasks to the appropriate individual electronically, along with necessary information to complete that task.

The SmartStream Activity Manager and Workflow Workbench help you accomplish this.

SmartStream identifies a business procedure as an *activity*. An activity may be processing invoices or issuing purchase orders and it may have several steps or *events* (such as a credit approval). When an event occurs, Activity Manager identifies all of the event's *next steps*, and send messages to the users who are responsible for them. It addresses the workflow requirements of *who's next* and *what's next*. (Activity Manager is described in greater detail later in this section.)

The SmartStream interface is a critical component that ensures user interaction with the system is productive within the workflow environment. Screen presentation of information is organized around the familiar metaphor of file cabinets, file drawers and folders. SmartStream includes a special type of folder placed on the user's desktop called the *To-Do* folder. It is through this folder that SmartStream automatically notifies the user of what they need to do. The To-Do list is dynamically generated as events flow to each user's attention. The user is also routed the necessary information to act upon that message.

The following figure shows a workflow example with activities, events, and next steps.

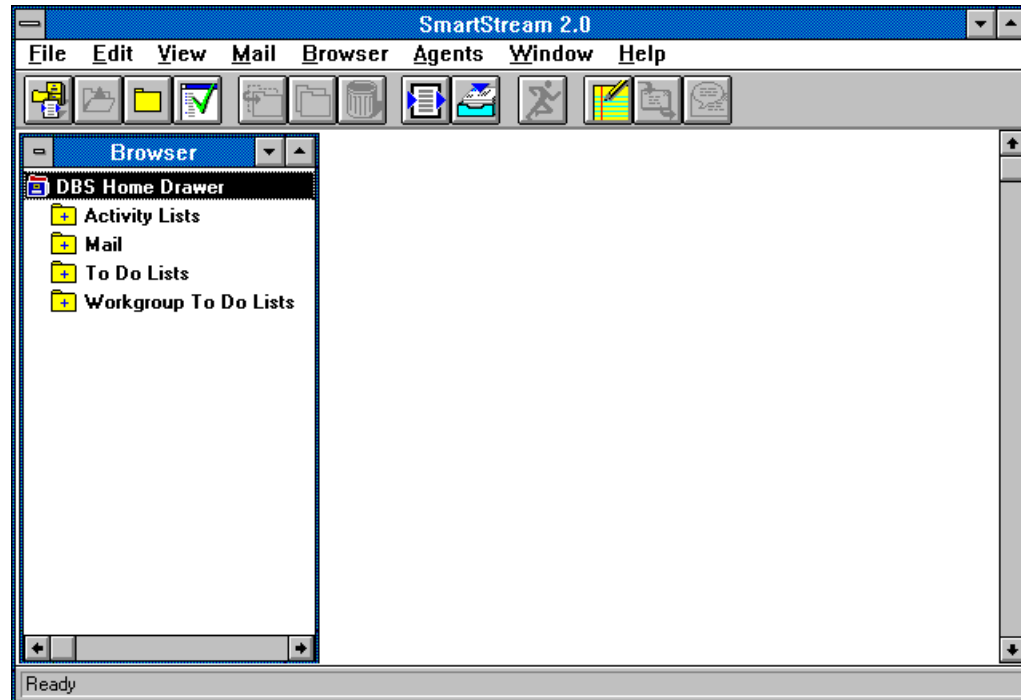


Activity: Invoice Processing Example

Example: Class Registration

The following example shows how one workflow user registers for a class on her desktop, and how a class administrator approves the registration. It demonstrates how the SmartStream's Browser makes it easy to access tasks within the workflow. Rather than a menu-driven tool, Browser is a navigational aid that lets users know when they need to perform tasks and what they should do next.

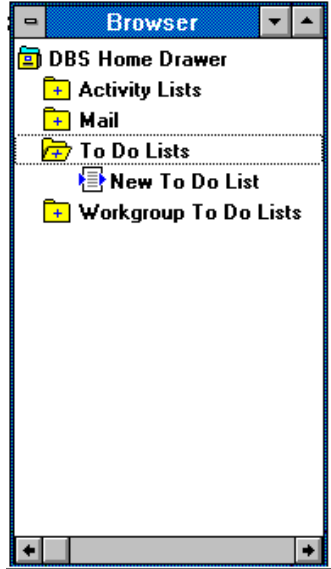
1. After the user logs onto SmartStream, the Browser screen is displayed.



SmartStream Browser Screen

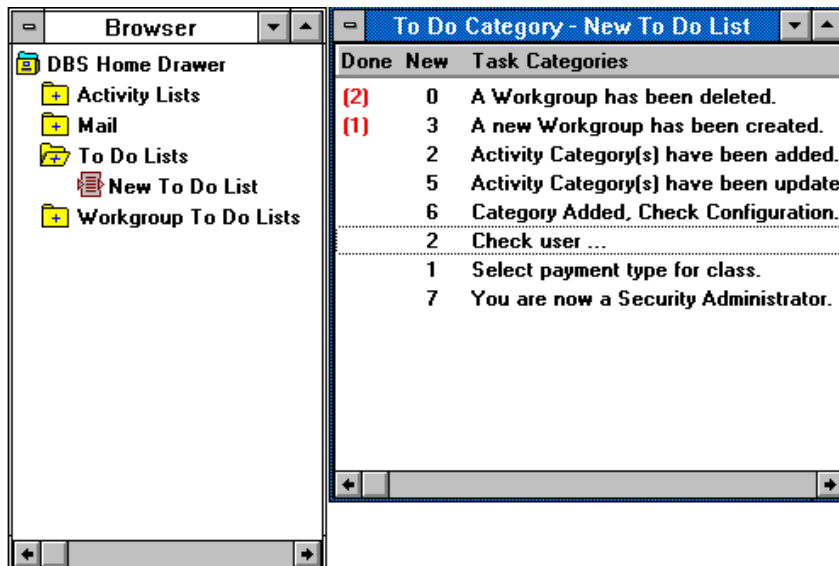
The plus sign in the To Do folder icon indicates that there are new To Do's waiting for appropriate action.

2. She selects To Do Lists and the New To Do List icon appears.



New To Do List Icon

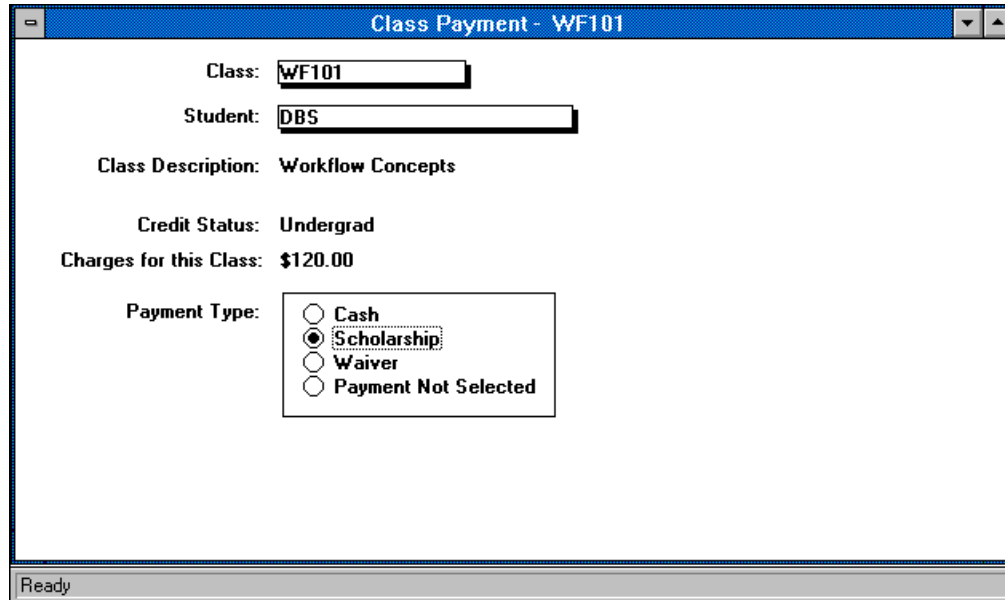
3. She selects the New To Do List icon and the New To Do List screen appears.
4. She clicks on the new message in the Select payment type for class category.



New To Do List Screen

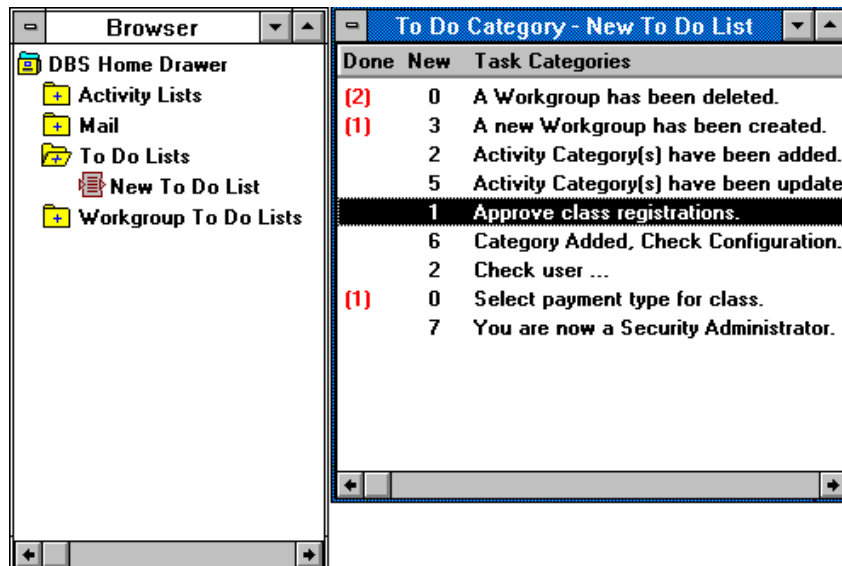
The Class Payment screen appears. (Note that this screen was designed within a separate SmartStream application.)

5. She selects "Scholarship" as the Payment Type and saves the screen.



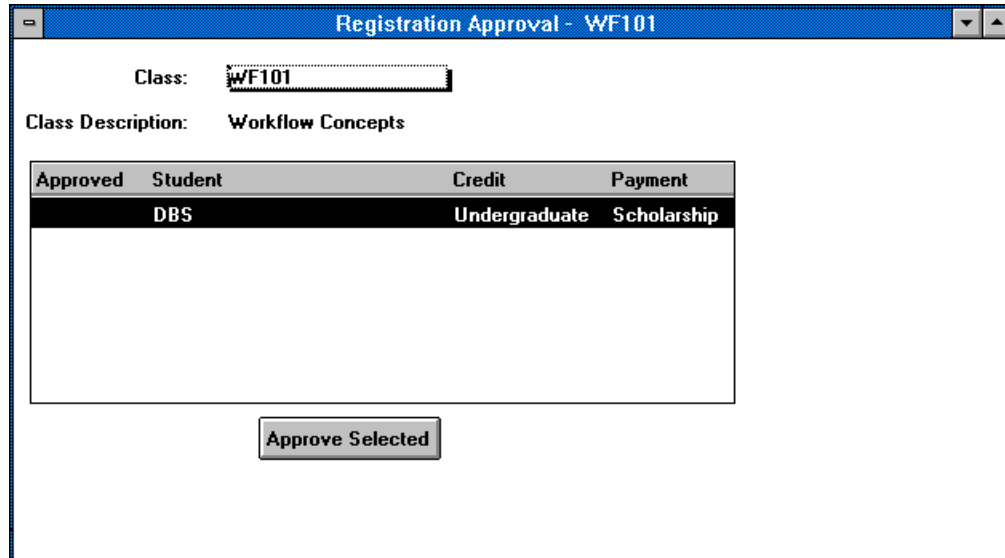
Class Payment Screen

6. As soon as she saves the screen, a popup message appears on the desktop of the next person in the workflow, the class administrator. It states that he has a new To Do in his To Do folder. When he accesses his New To Do List, he notices he must approve a class registration.



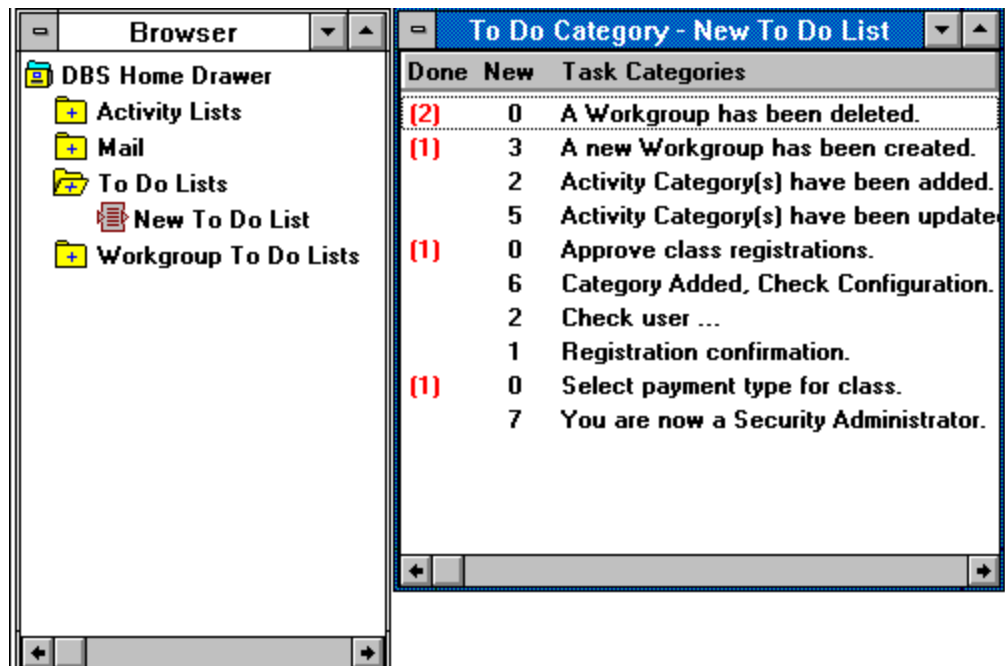
Class Administrator's New To Do List

7. He clicks on the Approve class registrations To Do and the Registration Approval form appears.



Registration Approval Screen

8. When he clicks on the Approve Selected box and saves the form, the To Do is then routed to the next person in the flow.
9. When the class administrator redisplay the SmartStream window, he refreshes his display. A (1) appears in the Done column for the Approve class registrations To Do, indicating that the task has been completed.



Refreshed New To Do List

Example: Entering a Payment for Purchase of Fixed Asset

The following Financial Stream example shows how a user processes an invoice in Accounts Payable and fills in an entry in Fixed Assets. (Note that these two activities are normally completed by two people.) It demonstrates how workflow can be used to link applications --- what happens in one application affects the other.

1. A worker has selected the Invoice Activity from his Main Activity Manager Window. The main view of the Invoice Window appears.

The screenshot shows a software window titled "Activity Windows - [Invoice - LB-0921A]". The window contains several sections:

- Vendor Information:** Vendor: DFFWHS, Vendor Location: 001, Invoice Number: LB-0921A, Invoice Date: 9/21/1993, Scheduled Payment Nbr: 0.
- Vendor Name and Remit Address:** Office Warehouse, 110 Newton Road, Atlanta, GA, 30326.
- Payment Details:** Payable Entity: USGEN, Terms: 2/10N30, Voucher: (empty), Status: Incomplete, Disc Due Date: 10/1/1993, Currency: USD, Invoice Type: Invoice, Final Due Date: 10/21/1993, Comments: (empty).
- Table of Invoice Lines:**

Line	Amount/Description	Alias	Entity	Division	Account	Department	Product	Project
1	1,899.32		US3	ADMIN	15420			
	Diskless Workstation 486DX							

Below the table, there are summary fields: SALES TAX - US: 0.00, Freight: 0.00, Discount: 0.00, Misc Charge: 0.00, and Total: 1,899.32.

Invoice Window

2. He clicks on the item marked "Diskless Workstation 486DX" (below Line 1) to display the invoice line detail for the item.

Activity Windows - [Invoice - LB-0921A]

File Edit Options Settings Window Help

Line: 1 Amount: 1,899.32 Desc: Diskless Workstation 486DX

Alias: Entity: Division: Account: Department: Product: Project:
 US3 ADMIN 15420

Earnings and Withholding Information

Rule: Category: Amount: 0.00

Discount: 0.00 Alloc Disc
 Freight: 0.00 Alloc Freight
 Misc Charges: 0.00 Alloc Misc

Asset Information

Asset Entity: US3
 Asset:
 Serial Number: SN-000-881-763
 Model/Part Number: PN-9-2334-556
 Manufacturer: Compaq
 Quantity: 1

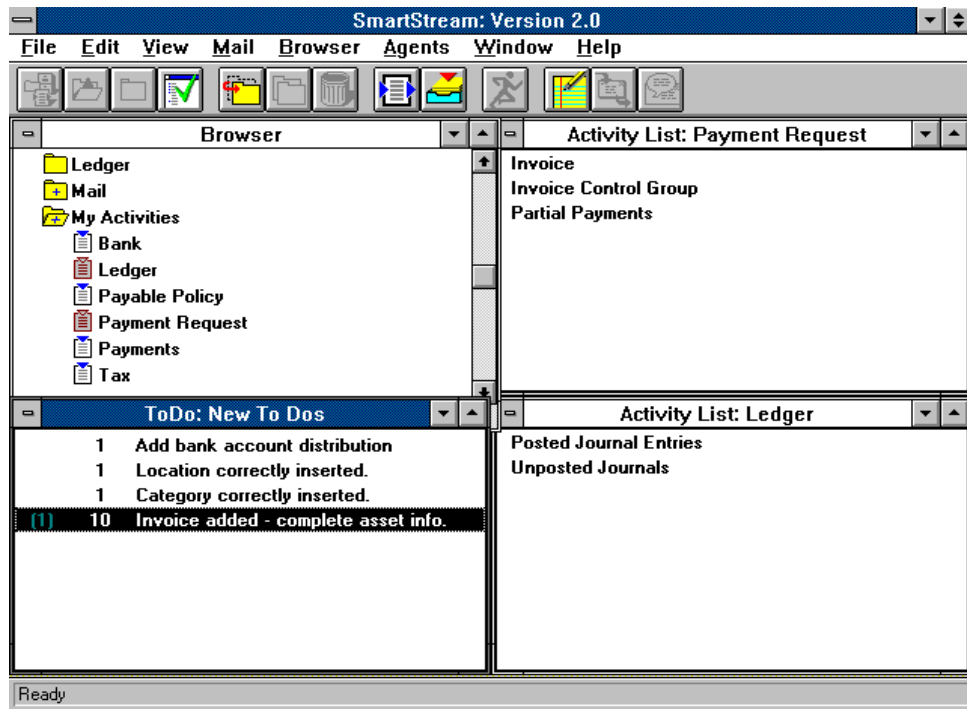
Tax Rule	Tax Rate Code	Reclaimable Code	Tax Amount	Tax Expense
SALES TAX - US			0.00	0.00

Ready

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Line Detail of Invoice

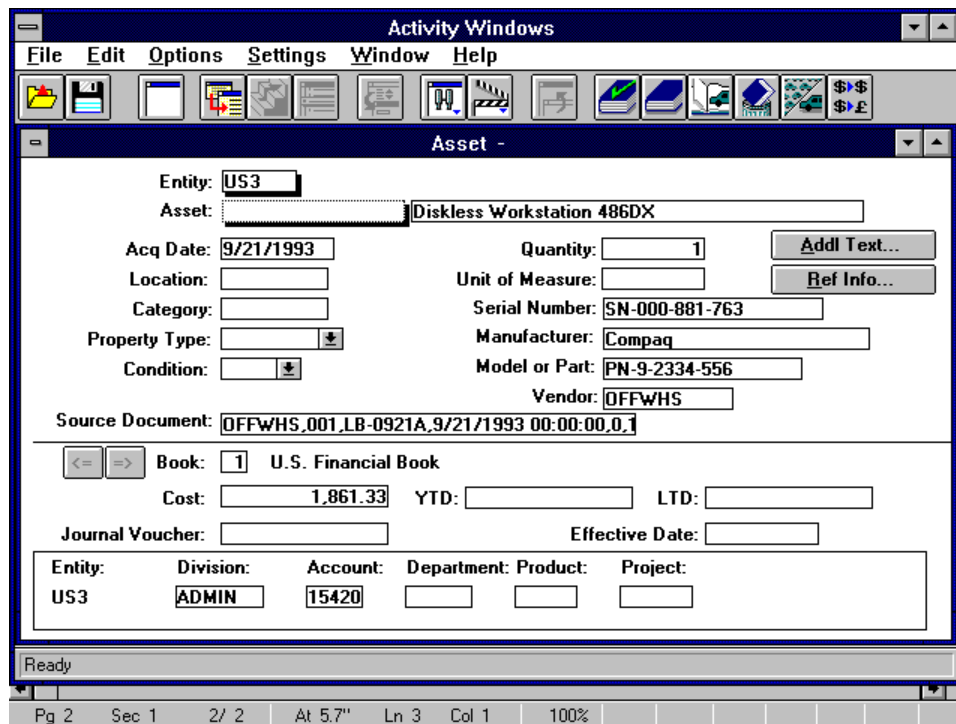
3. He then manually fills in asset information, such as the Asset Entity number, the Serial Number, and the Model/Part Number.
4. He clicks on the disk icon on the tool bar and saves the invoice. As soon as he saves the invoice, Activity Manager displays a message box, indicating that he has a message. (Normally this message would appear on the desktop of the Fixed Assets worker, the next worker in the flow.)
5. He acknowledges it and the new To Do message appears on his desktop: "Invoice added - complete asset info."



To Do Message Appears in To Do Folder

Workflow has generated a new To Do, telling him he has to complete the asset information.

6. When clicks on the To Do, the Fixed Asset screen appears.



Fixed Asset Form to be Filled Out

Note that the Asset form picked up the information from the invoice, such as Serial Number and Manufacturer name.

7. At this point, the worker completes the form (filling in such information as Location, Category, and Property Type) and saves it. During the save process, the system automatically generates a number for the Asset field.

The Asset form is now completely filled out and ready for the next worker in the flow.

Activity Windows
File Edit Options Settings Window Help

Asset -

Entity: US3
Asset: 30030100 Diskless Workstation 486DX

Acq Date: 9/21/1993 Quantity: 1 Add Text...
Location: ACCTG Unit of Measure: EACH Ref Info...
Category: COMPTR Serial Number: SN-000-881-763
Property Type: Personal Manufacturer: Compaq
Condition: New Model or Part: PN-9-2334-556
Vendor: OFFWHS

Source Document: OFFWHS_001_LB-0921A,9/21/1993 00:00:00,0,1

Book: 1 U.S. Financial Book
Cost: 1,861.33 YTD: 240.42 LTD: 240.42
Journal Voucher: Effective Date: 11/30/94

Entity:	Division:	Account:	Department:	Product:	Project:
US3	ADMIN	15420	ACCTG		

Ready

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Fixed Asset Form after Asset was Saved

Activity Manager and Workflow Workbench

A key component for defining workflow is SmartStream's Activity Manager, which breaks up key activities (such as invoice generation) into discrete events. An event is any task a worker executes, such as obtaining a vendor tax ID or checking why an invoice is incomplete. When events take place, workflow automation knows what the next step is, as well as how to route the completed task to the next worker in the flow.

SmartStream is delivered with activities, events, next steps, and messages predefined. However, each customer can customize workflow in the following ways:

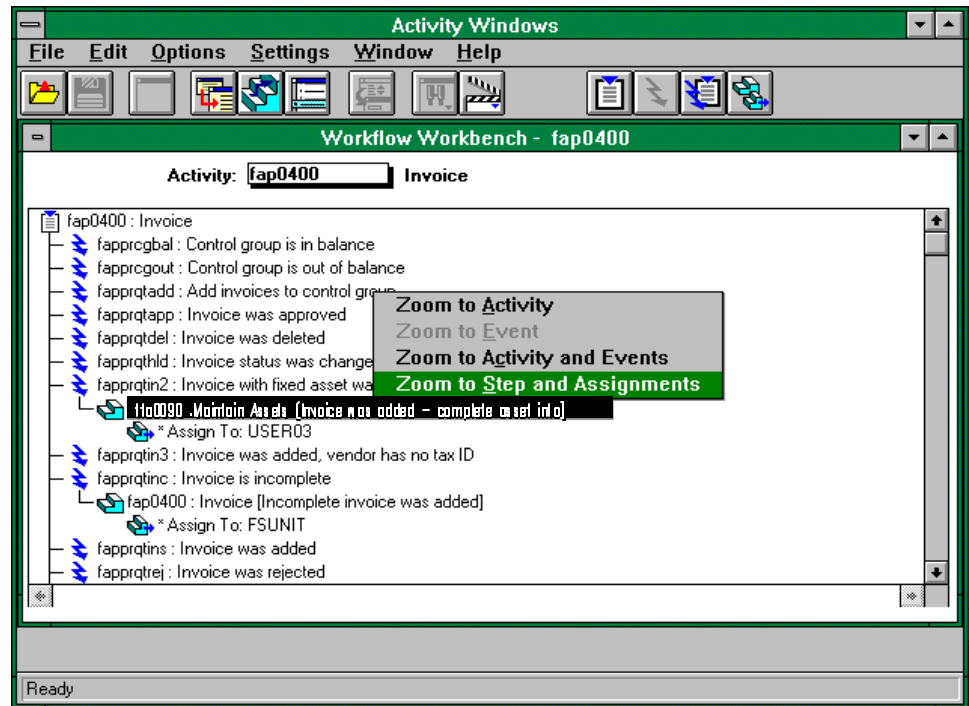
- Define and maintain security for users and groups
- Define new steps and disable old ones

- Alter procedures as policies change

Example: Sample Workbench Session

The following example show how SmartStream's Workflow Workbench displays the events in a workflow and assigns a next step in the flow to an appropriate user.

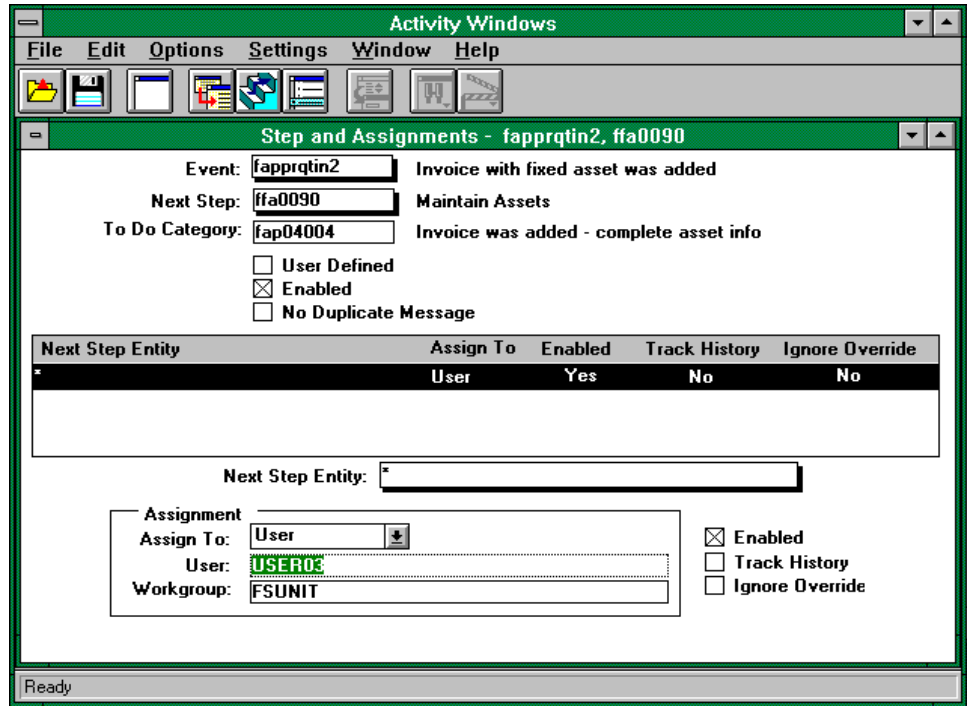
1. An administrator displays the Workflow Workbench screen to review the Invoice activity and examine a next step for an invoice management event.



Workflow Workbench Screen

All events are preceded by a jagged arrow icon and next steps by a step icon. The administrator selects the Maintain Assets Next Step. The text that appears in brackets, "Invoice was added - Complete asset info," is the title of the To Do that will appear in the worker's To Do folder.

2. The administrator wants to find out if the Next Step is enabled and what its system priority is. She brings up a popup menu and selects Zoom to Step and Assignments. The Step and Assignment screen appears.

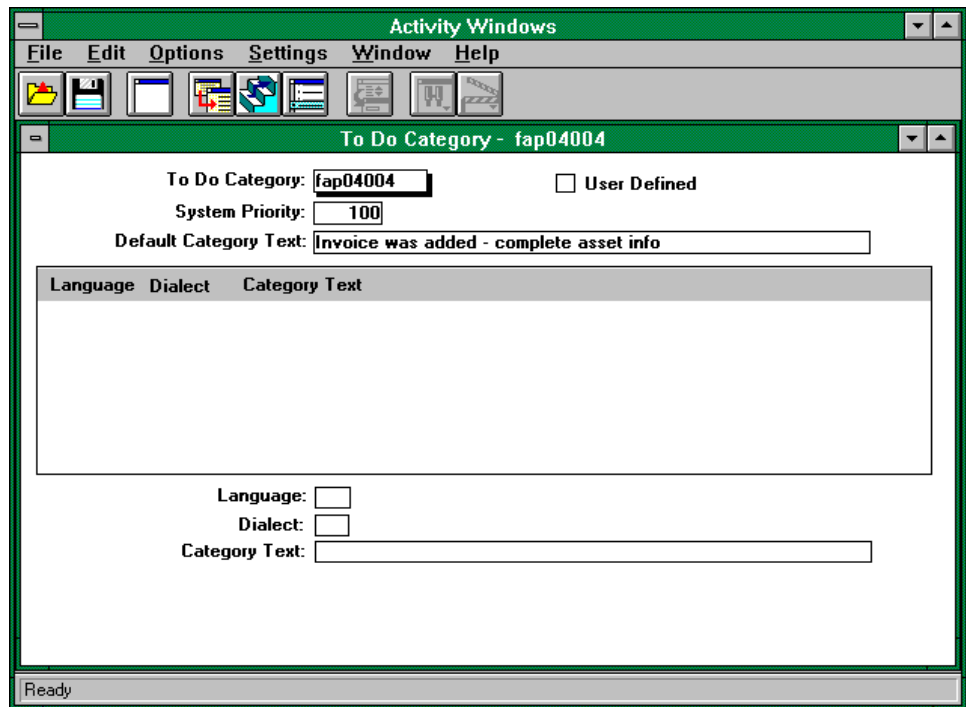


Step and Assignment Screen

In addition to listing the name of the Event, the Next Step, and the To Do category, the top portion of the screen displays a check box indicating that the Next Step is enabled. The middle portion displays a highlighted User assignment. (It is possible to have multiple assignments for the same step.)

3. By positioning the cursor in the To Do Category field and using the zoom feature, the administrator then displays the To Do Category screen.

She notices that the system priority for the task is 100, which is the lowest level. She decides to leave it at that level rather than changing it to 1, the highest priority.



To Do Category Screen

Agents

Agents can be useful supplements to activity manager workflow or ad hoc workflow events. As personalized task handlers, they reside on the user's desktop and act on the user's To-Do list. They can be configured to a user or for a group of users. Agents allow users to set up their computers as their representative or agent. An agent is designed on rule-based statements or instructions. Operating as an ad hoc situation, an agent acts on incoming messages as if it were the user interacting with the screen. It can make decisions based on pre-established conditions. Agents also may be scheduled to process during pre-defined time periods.

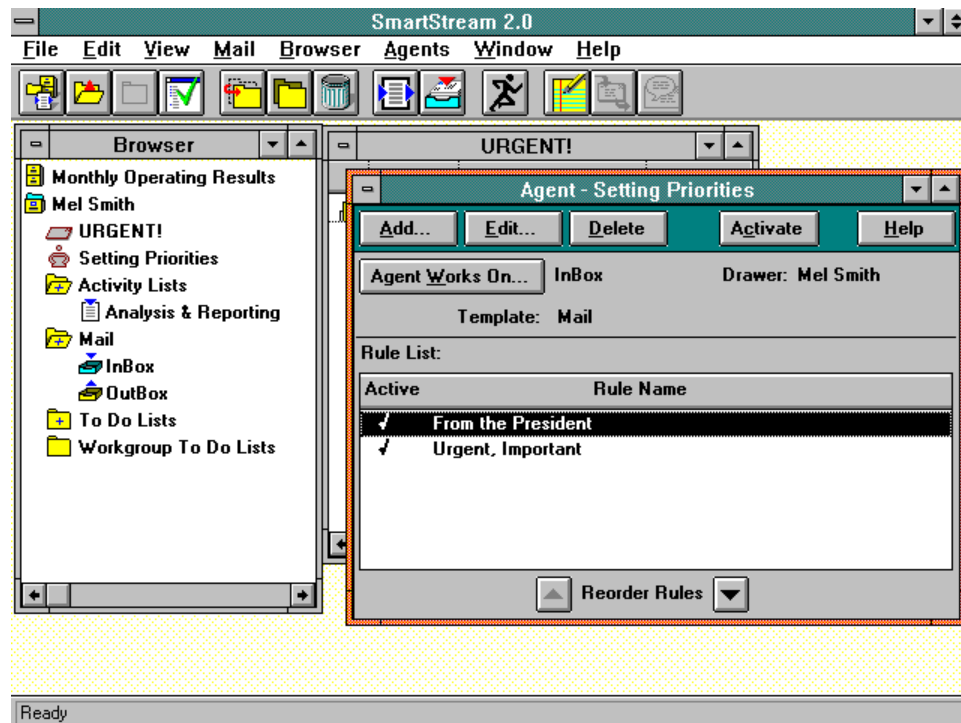
Agent filters can examine the information coming into a user's desktop and perform actions such as

- Moving the object to another folder
- Forward the object to another user
- Copying, printing, or deleting the object

Example: Customizing an Agent Rule

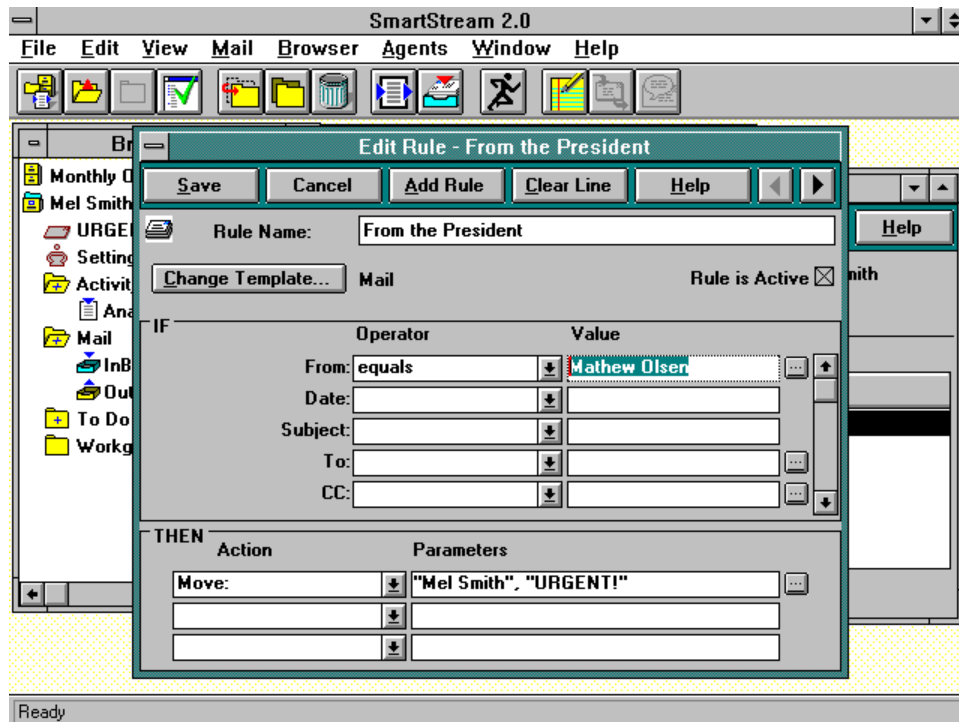
In the following example, Mel Smith has programmed an agent rule named "From the President," which he wants to edit.

1. From the SmartStream desktop, he invokes the Agent Setting Priorities screen by clicking on the Agent icon on the toolbar (the running figure). The screen displays the list of defined agents.



Agent Setting Priorities Screen

2. He highlights the agent named "From the President" and clicks. The Edit Rule screen for that agent appears.



Edit Rule Screen

Mel has defined his agent to filter all incoming messages whose From field lists the president, Matthew Olsen. This is the IF portion of the agent rule.

- At the bottom of the screen, he defines the THEN portion to move all messages from Matthew Olsen to his URGENT! folder on his desktop. That way he can give priority to the president's messages.

Evolution of Workflow and SmartStream

How will SmartStream's workflow operate like in the future? What will it look like? Of course it is difficult to predict exactly what tasks it will perform or what forms it will take; however, D&B Software has both short and long-term plans for workflow.

In the near future, D&B Software will examine the following enhancements to its workflow implementation:

- Improve the graphical user interface. SmartStream's workflow will have more Windows-standard features, like drag and drop, cut and paste, and so on.

- Supply more workflow design tools. For example, include a software development kit (SDK) so that users can add new events to the Workbench screen.
- Add performance tracking ability. With a performance tracking database, administrators can determine where the flow is at a given moment and determine if its efficiency can be improved.
- Add more sophisticated ad hoc workflow capability. Currently agents allow ad hoc workflow, with their ability to assign and prioritize To Do items. However, more document-centric features such as linking images with invoice forms may be incorporated in the future.

In the distant future, D&B Software will

- Develop simulation tools that allow users to do load balancing analysis before they implement workflow at their sites. With such tools, administrators can determine where the bottlenecks are going to occur if, for example, they add new workers to the flow.
- Work on developing an industry-standard API for workflow in conjunction with other vendors. If such an alliance is fruitful, it may be possible to program workflow into an operating system such as Windows or OS/2.

The future for workflow is exciting, one with unlimited possibilities. D&B Software will be in the forefront of this development, supplying its customers with new tools to enhance productivity and efficiency.

The SmartStream Series

Dun & Bradstreet Software's new generation of business software - the SmartStream Series - is specifically designed for enterprise-wide client/server computing. SmartStream includes robust applications that deliver flexible business process automation, tightly integrated with decision making support facilities. With over twenty five years in the software industry, D & B Software is the world's most experienced software company. We offer comprehensive consulting, education, documentation, and 24 hour support services to ensure your organization's success with SmartStream.

The SmartStream Platform

The platform provides underlying technology, common services and enablers that create a seamless, cohesive environment for productive computing, and are used by the SmartStream transaction processing applications and SmartStream Decision Support. They are:

- *Activity Manager.* Workflow technology for flexible, distributed business process automation.
- *The Microsoft/Sybase SQL Server relational database management system.* It provides high performance, and sophisticated storage and retrieval capabilities in an enterprise environment, while ensuring data integrity and security. A limited use, run-time version of SQL Server is bundled with SmartStream and is fully supported by D & B Software.
- *SmartStream Structures.* A structure definition facility, delivering consistent and flexible hierarchical views of organizational data and provides a business context for accessing and distributing relational information.
- *SmartStream Job Scheduler.* A job scheduling facility for automating multiple step back end processing across several computer platforms.
- *SmartStream Assistant and Product Request.* Automated support tools for help desk management.
- *SmartStream Security.* Comprehensive security facilities for managing access to functions and data.
- *SmartStream's Electronic Mail Interface.* Support for industry standard electronic mail and directory services to enable efficient information distribution.

SmartStream Decision Support

SmartStream Decision Support includes four integrated components that ensure cohesive, consistent and efficient decision making activities, either by an individual or within a workgroup or across an enterprise. These facilities, which share the common services provided by the SmartStream platform, include

- *SmartStream Query and Reporter*. D & B Software's facility for enterprise data access and presentation, supporting easy access to complex information in a business context.
- *SmartStream Analyzer*. A flexible multi-dimensional, drill down, data analysis tool.
- *SmartStream Management Reporter*. An advanced report writing tool (built upon Query and Reporter) for generating the class of financial reports that includes income statements and balance sheets.
- *InterQ*. A high bandwidth connectivity module that transports data from distributed mainframe or midrange based systems to localized SmartStream servers.

SmartStream Applications

Built upon an integrated and comprehensive Enterprise Model, SmartStream transaction processing applications take advantage of platform capabilities such as workflow, and are supported by the SmartStream Decision Support system. Fully robust, and built to support high performance computing in a client/server environment. They include:

- *Financial Stream* (General Ledger, Payables, Receivables, Asset Management and Currency).
- *HR Stream* (Payroll and personnel management, Flexible Benefits).
- *Distribution Stream* (Purchasing, Order Management, Dock Management, Inventory Management and Control).
- *Manufacturing Stream* (Product Definition and Manufacturing Planning).

Third Party Technologies and SmartStream Development

The SmartStream platform and applications use common services which are built with a number of leading edge technologies embedded into SmartStream. Although several of these technologies are built by third parties, they are delivered, implemented, and fully supported by D & B Software. Use of third party technologies allows D & B Software to focus on our core competence as the leading supplier of business applications, while taking advantage of best of breed tools available on the market. SmartStream makes use of technologies such as Powersoft's Powerbuilder, Cognos' Powerplay, Microsoft Access and Sybase/Microsoft SQL Server.

- *The SmartStream Software Developer Kit.* To support the various technologies and tools included in SmartStream and provide to for an organizations need to plan, modify and control their SmartStream environment, D& B Software will be providing a developer kit in the near future.

Technical Environment

SmartStream was created to be a high performance client/server based system by being tightly integrated Microsoft/Sybase SQL server and taking advantage of it's ability to execute application logic at the database through the use of stored procedures and triggers.

SmartStream supports Microsoft/Sybase SQL Server's on IBM RS/6000, HP 9000, Sun Sparcserver and Data General Aviion running UNIX. Digital's Alpha is supported by Microsoft Windows NT, as well as Intel processors with OS/2. Client workstations run under Microsoft Windows. SmartStream supports MS Lan Manager, Novell Netware, and IBM's OS/2 Lan Server and TCP/IP. It also supports TCP/IP connections and LU 6.2 for host connectivity.

A

Activity

A predefined SmartStream workflow tool containing specific conditions, or events, that are likely to occur. For example, the Invoice activity may contain events such as an invoice being approved, deleted, or added to a control group. Attached to every activity are all the possible events that could occur.

Activity List

A SmartStream folder that contains the tasks that a user has defined for future completion. Unlike To Do's, the items in an activity list are not formerly part of workflow, nor are they inherently time-critical.

Ad Hoc Workflow

A type of workflow comprised of repetitive, unstructured processes that may involve different white-collar professionals with each transaction. Typical ad hoc workflow processes are product documentation, sales proposals, receivables assessments, and product evaluations.

Administrative Workflow

A type of workflow involving simple, form-intensive tasks like check requests, purchase orders, and personnel procedures. Administrative workflow is used to process in-house work and rarely interacts with customers or other companies.

Agent Processing

Automatic, rules-based processing of information by semiautonomous agents in a mail-enabled environment. The agent acts automatically in behalf of the user in response to events that trigger it to respond.

The D&B Software client/server architecture uses its own mail-enabled groupware software, SmartStream. In SmartStream, an agent consists of one or more tasks with attached rules.

AMAPS

Advanced Manufacturing Processing System. D&B Software's manufacturing solution for the IBM mainframe, HP3000, and AS/400.

API

Application Program Interface. The language and format used by a program on one tier of the client/server platform to communicate with a program on another tier. It may also include the commands used to interrupt the computer to get the attention of the other program.

Architecture

A systems design that employs protocols and interfaces for interacting with other programs. Architecture remains open to future flexibility and expandability. Stand-alone programs have program logic but no architecture. The SmartStream architecture is built on a two-tiered platform of client and server. The server component includes the host or metaserver.

B

Browser

A navigational tool that uses a metaphor of drawers and folders within the SmartStream desktop. The folders' contents are forms, electronic mail messages, or application tasks. The Browser helps users organize their work and create logical groupings that let them navigate among all information and application activities.

C

CASE

Computer-Aided Software Engineering. Software applied to each step of an information system's development. It provides ways to automatically plan and document traditional, structured programming techniques using a language that can generate the required programs for that system.

Client Application

The component in a client/server architecture that provides a graphical user interface and performs some processing. The client requests services from the server component of the architecture.

In the SmartStream architecture, a client application (a workstation or PC) is the first tier of a two-tiered platform.

Client/Server Architecture

Architecture in which the client is the requesting machine (personal computer or workstation) and the server is the supplying machine (LAN file server, mini or mainframe). The client provides the user interface and performs some or most of the application processing. The server maintains the databases and processes requests from the client to extract data from or update the database. The server also controls the application's integrity and security. Contrast with centralized processing, in which dumb (non-processing) terminals are connected to a mini or mainframe.

D

Database Server

A computer in a LAN dedicated to database storage and retrieval. Contrasts with file server, which stores many kinds of files and programs for shared use. In a client/server architecture, the database server is usually the host/metaserver. SmartStream uses Sybase's SQL Server.

DBMS

Database Management System. Software that concurrently organizes, stores, and retrieves data on a database, protecting it from unauthorized access or corruption. The requests for data from a client application program are transferred based upon instructions to the server operating system. A DBMS permits information systems to change with an organization's requirements, without disrupting the existing system.

Features of a DBMS include data security, data integrity, interactive query, interactive data entry and updating, and data independence.

DDE

Dynamic Data Exchange. A Windows message protocol that enables an application in one window to query or transfer data automatically to another window.

Decision Support System

A system that enables a user or a workgroup to access, analyze, present, and distribute data. A decision support system must provide the ability to transform raw data into meaningful information by providing a business context to the decision maker. Typically, it would include query and reporting capability, along with various analysis tools.

Distributed Systems

Computer systems in multiple locations throughout an organization working in cooperative fashion. The system at each location primarily serves the needs of that location, but can also receive and supply information from other systems within the network.

Distributed Function Client/Server Computing

A type of architecture that uses the relational database management system (RDBMS) server as an application engine with only a minimum amount of application logic executing on the desktop. D&B Software's SmartStream strives to maximize the amount of application logic executing on the server.

Distributed Processing

A method of spreading related tasks across two or more separate computer systems connected together by a communications network. The network supports each system's appropriate workload.

DLL

Dynamic Link Library. Stored program routines accessible to runtime applications.

E

E-Mail

Electronic Mail. An electronic messaging system that allows computer network users to communicate with each other directly or by bulletin boards and distribution lists.

E-Series

Expert Series. D&B Software's (formerly Management Science America [MSA]) enterprise-wide financial and human resource applications that run on IBM mainframes.

Event

A condition within a SmartStream workflow activity that is likely to occur, either because of actions users have taken or because of data applications that workflow has encountered. Typical events are adding an invoice to a control group or checking an incomplete invoice.

F***File Server***

A node on a LAN that stores the programs, data files, and other resources shared by the rest of the PCs on the LAN. A file server is also referred to as a network server, which acts as a remote disk drive.

Flow

Depending on context, *flow* can either refer to the flow of information from person to person, or to the flow of activities to be done (known as To Do's in the SmartStream environment), each of which is assigned to a specific user within the workflow.

Fourth-generation

An advanced computer language that employs English-like programming commands. Fourth-generation languages can be found in dBase, query languages, and report writers. They are distinguished from third-generation languages, which use the input-process-output logic of traditional programming languages such as C, FORTRAN, COBOL, and so on.

G

GUI

Graphical User Interface. GUI technology has led to greater usability for workflow systems, particularly in the Microsoft Windows graphical environment. For example, within SmartStream, users point and click on To Do and Activity List folders to display the status of current actions, as well as see what actions must be done next. Since SmartStream's Activity Manager is message driven, a user may receive a popup message stating he needs to approve an invoice. The user clicks on the message, which invokes an accounts payable task, processes the work and sends it to the next person in the flow. Throughout the entire process, the GUI has simplified workflow by guiding the user from step to step. For a sample SmartStream session, refer to the section "How Users Interact with Workflow."

Gateway

A communications bridge that translates dissimilar communications protocols so that data can move in either direction. For example, a gateway can connect a local-area network to either a host system, an external database, or another network.

Groupware

E-mail based applications that enhance an E-mail system's one-to-one messaging to enable workflow management and work group communication. Groupware enables the structuring of tasks and the

tracking of group projects by providing a framework that gives messages context. Groupware turns data into information.

H

Host

The main computer in a network, providing services such as database access and advanced programming. The host functions as a storage center for data accessed by a LAN-based server. Traditionally, mainframes are minicomputers.

I

InterQ

The connectivity platform for the D&B Software client/server architecture that provides selective retrieval and update between E and M Series host applications and client/server relational databases. InterQ allows the downloading of host data for efficient and easy access on a LAN server. It can be initiated from both a workstation and a host. Pieces of InterQ reside on client, server, and host.

L

LAN

Local-area Network. A communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system, and a communications link.

LAN Manager

Microsoft's LAN application under OS/2 in a server that also supports DOS, OS/2, and UNIX workstations. Its Interprocess Communication (IPC) is named Pipes and shares files with Microsoft's SMB. Pieces of LAN Manager reside on both client and server.

LAN Server

IBM's version of LAN Manager. Like LAN Manager, it accesses data and resides on both client and server.

M

M Series

Millennium Series. D&B Software's (formerly McCormack & Dodge) financial and human resources software that run on IBM mainframes and DEC VAX computers.

Mail Agent

SmartStream's electronic task handler that performs different tasks. Rule-based intelligent agents sort incoming messages into meaningful categories (or folders), rate the messages based on importance and urgency, and find specified kinds of information. In addition, mail agents automatically respond to certain kinds of messages and can suggest possible actions.

MAPI

Mail Application Program Interface. The Microsoft E-Mail and messaging interface.

D&B Software (DBS) chose MAPI for SmartStream's E-mail interface. DBS currently uses simple MAPI, which is tightly integrated with the popular Microsoft Windows environment and assures communication with other Windows users. In addition, it provides an application program interface (API) that allows users to develop their own applications on top of MAPI. When extended MAPI becomes available, DBS workflow will take advantage of its ability to deal with complex messages and access directory services.

MHS

Message Handling Service. E-Mail system from Action Technologies, Inc., Alameda, CA, licensed by Novell for its NetWare operating systems. It allows message routing and transfer between users. It also provides store and forward capabilities.

N

Network Server

A node on a LAN that provides communications between multiple servers and shares resources with the other PCs on the LAN. In addition to basic connectivity, it provides synchronization of services.

Next Step

A SmartStream procedure that the assigned user is notified of as soon as a workflow event occurs. Typically, a next step is assigned to a user or

workgroup and, when completed, activates another next step in the workflow. A typical next step is the filling out of a fixed asset form after an invoice is added.

O

OS/2

Single user, multitasking PC operating system for 286s and up. The 16-bit versions have been developed jointly by Microsoft and IBM. The 32-bit versions is now exclusive to IBM.

It is an advanced operating system that is not confined to DOS's infamous 1MB limit. Although new commands have been added, many OS/2 commands are the same as in DOS. The 16-bit versions can address 16MB of RAM and 1GB of virtual memory. OS/2 requires 4MB of RAM (except for Version 1.3), but is often found running in computers with 8MB and more.

Object

A self-contained module of data and its associated programming.

P

Production Workflow

A type of workflow involving complex, highly structured processing activities, such as loan applications, engineering change orders, product development, and insurance claims. Production workflow is enterprise-wide; that is, it is driven by repeated customer interaction and must be continually refined and updated as new needs arise.

R

Relational Database

A way to structure files in a database to prevent records from linking together physically, while allowing for a logical linking by comparing or matching a common key field. Relationships between files are created by matching data, such as account numbers and names, and creating a new file from that match. A relational system can take two or more files and generate a new file (such as a table or index) from the records that meet the matching criteria.

Data resides in the new table, independently of the applications. Relational database technology in the client/server architecture allows for data independence from applications.

S

Server

The network software that maintains the databases and receives requests from a client application to extract or update data using a local-area network. The server also controls the application's integrity and security.

In the SmartStream architecture, the server contains the relational database and functions as the communications hub between the client and the host. It provides services to the requesting (client) processes,; manages the synchronization of services and communications using a DBMS when a request is initiated, and provides file services.

SmartStream Series

Dun & Bradstreet Software's new generation of business software. The SmartStream Series is specifically designed for enterprise-wide client/server computing. SmartStream's robust applications deliver flexible business process automation that are tightly integrated with decision making support facilities.

SQL Server

Relational DBMS built by Sybase, Inc. that can operate on OS/2, VAX, or UNIX workstations. It is designed for network use and is accessed by applications using SQL. D&B Software uses SQL Server as an application database engine at the server level. Additionally, SQL Server provides data integration at the server level between the existing D&B Software host-based applications and upcoming client/server applications. It also provides back-up and storage facilities, and native security.

Stored Procedure

A named group of related SQL statements and associated program logic that can be executed by a single request from a client. In addition, the stored procedures can be shared by multiple clients. The portion of the stored procedure compiled and stored on the database server/host reduces network traffic by eliminating the need to interpret application code each time it executes.

T***To Do***

A task that appears on a user's SmartStream desktop. A To Do is an integral part of workflow; as soon as the user completes the To Do, it becomes a new task and is automatically forwarded to the next user in the workflow.

Transaction Processing

The processing of an application as it is received by a system. A TP system updates master files as soon as they are entered at terminals or arrive over communication lines.

Trigger

The automatic initiation of a transaction enabled by stored procedures. Triggers can also be nested on tables modified by additional triggers. Transact SQL permits nested triggers to execute up to 16 levels.

U***UNIX***

A family of operating systems licensed by AT&T that are known for their relative hardware independence and portable applications interface.

V***Viewer***

A SmartStream display tool that allows users to view the contents of a To Do or a report displayed within the Browser.

VIM

Vendor Independent Messaging Interface. An E-mail protocol developed by Lotus, Apple, Novell and Borland.



Windowsä

The graphics-based operating environment from Microsoft that D&B Software uses as a critical component of its client/server architecture. Besides the window metaphor itself, Windows employs a desktop environment metaphor that allows different applications, or multiples of the same application, to stay active in related windows that can be resized, downsized, and relocated on screen. Users can switch back and forth between active windows. Windows resides on the client.

Workflow Workbench

SmartStream's graphical representation of a workflow. Each workflow contains one activity, and any number of events and next steps.

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THE AMERICAS

(Corporate Headquarters)
3445 Peachtree Road, NE
Atlanta, GA 30326-1276
(404) 239-2000

EUROPE

Tour Leopold
Rue de Genève, 10
1140 - Brussels
Belgium
(2) 727-7811

ASIA/PACIFIC

19 Havilah Street
Chatswood NSW 2067
Australia
(2) 934-2222
