A Graphical User Interface for a Multimedia Environment

The HP Visual User Environment, or HP VUE, provides not only a friendly user interface to the HP-UX* operating system but also a framework for the HP MPower system.

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It was inevitable that once the multitasking, multiuser, and network capabilities of the UNIX* operating system were connected with the power of graphics workstations that the next step would be to civilize the UNIX command line interface with a graphical user interface (GUI). Graphical user interfaces are literally changing the face of UNIX systems, and in doing so, are helping to spread UNIX systems and workstations from their historical installed base among technical users into the broader markets offered by commercial computing.

Among these GUIs is the HP Visual User Environment (HP VUE). HP VUE is the first GUI to provide the following features and capabilities for workstations running the HP-UX operating system:
- PC-compatible controls
- 3D visual appearance
- A graphical user interface to the system's particular functionalities while hiding the peculiarities of the system from the end user
- Multiple levels of integration for in-house and ISV (independent software vendor) applications.

As the framework for HP MPower, HP VUE provides the structure into which multimedia components can be integrated.

HP VUE provides a consistent set of controls with which to operate a workstation. While UNIX system commands contain a lot of functionality, this functionality is often cryptic, hard to understand, and difficult to remember, especially for occasional users. Additionally, UNIX system commands and their options are often inconsistent (some commands provide output, others don't, and what an –o option means depends on the command, not the functionality of the option). HP VUE changes all this. HP VUE uses a simple set of graphical controls, consistent with the Common User Access (CUA) model followed by Microsoft,® IBM Corp., and many other PC manufacturers. The CUA model is based on pushbuttons, scroll bars, and menus.

A user familiar with similar controls such as Microsoft Windows can sit down at a workstation with an HP VUE user interface and immediately take control because the skills required to operate a PC GUI are the same as the skills needed to operate an HP VUE workstation.

To operate a UNIX system from the command line, a user has to type commands and command options at the keyboard. A spelling mistake or a typing error could mean disaster. Commands, unless memorized, have to be looked up in the documentation. HP VUE unburdens the user from having to memorize UNIX commands and retype faulty command lines. To operate an HP-UX system from HP VUE, a user directly manipulates the graphical objects that populate the workspace. For example, to move a file from one directory to another, the user drags the file icon from one file manager view to another and drops it there. To start an application, the HP VUE user double-clicks the application icon.

One of the confusing things for users of an operating system is that they are required to develop a three-tiered level of consciousness: one level for the operating system, one for the application, and a third for their data, the only tier they are really interested in. New users have a difficult time distinguishing where one level stops and the other starts. Command line environments routinely demand that a user who wants to access data must switch from a data focus, remember which application works with that data (and possibly where that application is located), and negotiate how to start the application. Only after successfully starting the application can the user return to the desired data focus.

HP VUE, on the other hand, because it associates applications with data using an action and file-typing function, enables users to remain focused on their data, and the operating system and application tiers remain hidden by the user interface. To access data in the HP VUE environment, users double-click the data icon. The application starts automatically and loads the selected data file, leaving the user free to focus on work, not the mechanics of getting to work.

The HP VUE 3.0 Design Process

Getting HP VUE to its current state has been an evolutionary process. The process began in the mid-1980s when HP adopted the X Window System as the strategic graphical layer for workstations. This evolution continued through the development of the 3D window manager, hpwm, its submittal and acceptance by the Open Software Foundation (OSF) as an industry standard, the proliferation of OSF/Motif, the development of HP VUE 2.0, and finally, HP VUE 3.0.

During the design process of HP VUE 2.0 it became apparent that designing a user interface without user input would be a recipe for disaster. For the development of HP VUE 3.0, a more formalized approach to user input was established. This approach goes by the acronym QFD, for Quality Function

Deployment.[1] It was adopted for the development of HP VUE 3.0 to help ensure that:

- Customer input was systematically collected
- Customer input was quantified to define and prioritize product requirements
- Customer input was factored into the design process
- Product design was affected by the input as opposed to the input being interpreted to fit the design.

The QFD for HP VUE 3.0 was a multistep process. Keeping in mind that the primary target market for HP VUE consists of workstation users, we established a target design market for HP VUE 3.0 in the areas of factory floor operations, scientific research, industrial and architectural design, information engineering (knowledge workers), design engineering, education, CASE (computer-aided software engineering), and system administration. These design markets were given relative weights to facilitate the prioritization of their inputs. For example, input from scientific research with a weight of 5% wasn't nearly as influential as input from a knowledge worker with a weight of 35%. Within these areas, potential users were categorized on a UNIX knowledgeability spectrum that included categories for protected users, naive users, moderate users, and sophisticated users. Correlations were noted between these user types and our target design market. Over 30 companies were visited and asked to input into the HP VUE 3.0 QFD process.

The result was a weighted list in priority order of what customers wanted. Performance figured high on the list. Pizzazz† was also important. Of less importance were multiple fonts and workspace manager button labels. This list essentially formed a prioritized functional specification wish list for the HP VUE 3.0 product.

The Workspace Manager

HP VUE 3.0 workspace manager has a new look that differentiates it from HP VUE 2.0. This new look is part pizzazz and part pragmatism. The pizzazz is that the square button look of the 2.0 front panel is replaced by a "membrane" look in which the bevels demarking the buttons are removed and the icons that form the button labels appear inset into the front-panel membrane.

Fig. 1 illustrates the familiar "boxy" look of the HP VUE 2.0 front panel and the new and improved membrane look of the HP VUE 3.0 front panel. Notice also the slide-up subpanels available with the HP VUE 3.0 front panel. The tall subpanel on the left is the HP MPower media panel. HP VUE 3.0, as mentioned earlier, provides the framework for HP MPower.

Aside from supplying an easily recognizable visual distinction between the two versions of HP VUE, the membrane look makes the front panel easier to configure. To place a button in the old front panel required users to count the length and width of a button in pixels and then add pixels for the bevels. This proved to be a time-consuming and error-prone activity and certainly not user-friendly. The membrane look eliminates the need for users to count pixels. They simply specify the button, and the front panel magically grows itself to fit the new button.

† Pizzazz refers to those features in a product that might create customer excitement (e.g., garbage can icons that open when trash is tossed in or button icons that look and behave like real pushbuttons).
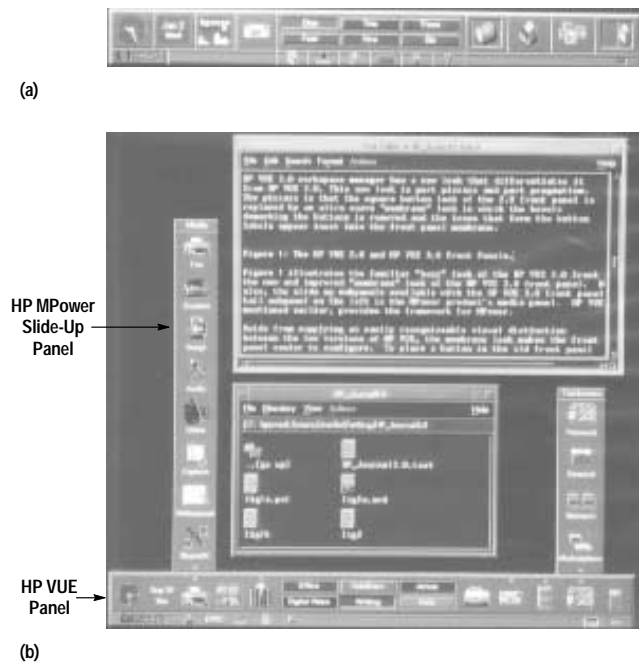

(a)

HP MPower Slide-Up Panel

HP VUE Panel

(b)

Fig. 1. (a) The "boxy" look of the HP VUE 2.0 front panel and (b) the new and improved membrane look of the HP VUE 3.0 front panel including the HP MPower slide-up subpanel on the left.

Another pizzazz and functional feature of the new front panel is the inclusion of slide-up subpanels. These panels slide up seemingly from behind the front panel when their control is pressed. The slide-up subpanels enable developers to make more controls readily available without taking up more space. They also provide a convenient place to locate the multimedia components of HP MPower. The slide-up subpanels can be torn off and posted to the workspace like a control panel.

The File Manager

The file manager is a good example of how QFD and usability studies can refine a product. HP VUE 2.0 packed a lot of functionality into the file manager. Virtually all system file management was available through the file manager's GUI. This is a good thing. However, what the 2.0 file manager didn't do, and what QFD and usability studies made apparent, was that all that functionality wasn't readily accessible.

The best example of this is the process of renaming a file. To rename a file in HP VUE 2.0, the user had to do the following:

- Select the file to be renamed
- Pull down the File menu
- Select Rename from the menu
- Wait for the Rename dialog box to appear
- Click the Rename text entry field in the dialog box
- Type the new file name
- Click the OK button.

As a result of feedback from QFD and the usability studies, the HP VUE 3.0 file renaming process involves the following steps:

- Click on the file name to change
- Type the new name
- Press the **Return** key.

Visually, the file manager didn't change that much between HP VUE 2.0 and HP VUE 3.0. However, the difference in ease of use and accessibility to file management functionality is quite significant.

The Style Manager

The HP VUE 3.0 style manager is another component that shows the subtle but unmistakable signs of the QFD process. While the work environment at HP is fairly open and users are fairly knowledgeable about the UNIX operating system, some of the system administrators and managers from customer sites often had more controlled environments for security reasons. Their feedback was the impetus for removing the Host dialog from the style manager. They wanted control over the X Window System's ability to host "foreign" workstations. Also, for security reasons, they wanted to control the ability of one workstation to host other workstations.

Along the same lines, security-conscious QFD participants requested that the little lock icon that appears on a locked workspace be changed to a full screen cover so that a passerby could not read information visible in the windows left open on the workspace.

Performance

Talk about graphical user interfaces long enough and eventually the discussion will get around to performance. Since HP VUE 2.0 is the most visible part of the operating system, it bore the brunt of a lot of negative performance comments.

Some of these criticisms, like "HP VUE is a big memory consumer because it takes up 16M bytes of RAM," are undeserved. HP VUE isn't really a heavy memory user, but to many users it may seem to be so. On a typical workstation with 16M bytes of RAM, the RAM is apportioned roughly as follows:

Miscellaneous Daemons	3M bytes
File Buffers	3M bytes
Kernel	3M bytes
X Server	2M bytes
Workspace Manager	1M byte
File Manager	0.75M byte
Help Manager	0.75M byte
Style Manager	1M byte
Hpterm Console	0.75M byte
Message Server	0.5M byte
Total	15.75M bytes

Nearly three quarters of the 16M bytes HP VUE is supposedly hoarding is actually being used by core system functions. The point that is most often misunderstood about HP VUE is that it is not a monolithic application, but a set of six components, not all of which need to be running at the same time. When something isn't running or being currently used, it is pushed out of RAM. As a matter of fact, at a minimal level, the user can run the workspace manager and receive the benefits of multiple workspaces for little more cost

in RAM than would be experienced with using a standard OSF/Motif window manager.

One of the criticisms that HP VUE does deserve is for the amount of time it takes to log in. For HP VUE 3.0, performance, as mentioned above, was a key design area. Besides speeding up the access to functionality like renaming files, which increased perceived performance, all HP VUE components and major processes were studied, including login, logout, file management, and session management. Customers were asked what trade-offs in functionality would be acceptable for the sake of better performance. Out of this research came a number of improvements. Instead of starting all HP VUE components immediately at login, their individual starts are staggered. Studies showed that starting processes all at once caused tremendous contention for RAM, while actually delaying a component's start until the preceding component was fully started. This staggered start of all processes reduced overall startup time.

Another result of the HP VUE 3.0 performance work was the development of a lighter-weight version of HP VUE. This lighter version of HP VUE has two of the most RAM-expensive components removed: session and file management. Reliance on a default HP VUE session instead of true session management speeds up the login and logout processes. Using the file management functions available on the file menus of all standard OSF/Motif applications instead of the HP VUE file manager avoids session slowdowns caused by the file manager's periodically jumping into RAM (and pushing the resident application out) to check that its file views match the current file structure.

Conclusion

One of the most gratifying results of the HP VUE 3.0 QFD effort was the affirmation from customers of our belief that a GUI is a work in progress, an evolutionary process. Dramatic differences between HP VUE 2.0 and HP VUE 3.0 were both uncalled for and unwanted. What customers did want was evolutionary changes, such as to make it easier to rename a file and configure the front panel. Our QFD customers were very attuned to HP VUE as an environment from which to access their working applications. Understanding their vision enabled us to take the next step in HP VUE's evolution: making HP VUE the framework for HP MPower.

Reference

1. S. Graves, W. Carmichael, D. Daetz, and E. Wilson, "Improving the Product Development Process," *Hewlett-Packard Journal,* Vol. 24, no. 3, June 1991, pp. 71-76.