Performance Comparison Macro:
The Value of Integration

Executive Summary

System performance is a function of more than clock speed alone. This demonstration is an attempt to prove that point in more graphic terms. An Excel macro has been included on this disk. When that macro is installed and run on a 16 MHz Macintosh IIcx and a 33 MHz Compaq 386/33, you will find that the "slower" Macintosh completes the exact same tasks in less time.

Background

Purpose:

This demonstration is intended to show the importance of system balance in a product's design. It is an attempt to demonstrate that clock speed is not the sole determinant of system performance. It is not a benchmark program.

System performance is a function of many factors, including but not limited to: clock speed, video input/output (I/O), disk I/O, system software design, the integration of the graphic interface and system software, and peripheral I/O (e.g. mouse, keyboard, etc.). Apple emphasizes balance in the design of its Macintosh computers while many competitive hardware firms focus heavily on clock speed alone. As a result, we find that running the *exact same application*, a Macintosh IIcx (clock speed 16MHz) finishes faster than a 33MHz Compaq 386/33.

Demo Design:

Users do not spend all of their time doing "recalcs" and huge re-formats of their data. We believe that much of the user's time is spent doing tasks that test other aspects of system performance as well: file access, graphic I/O, and data input. This demo is intended to recreate such a computing session.

The demo consists of a Microsoft Excel macro and related spreadsheets. When the macro is started (see "Setup" below), it runs through a series of operations intended to recreate a typical user's computing session. These include:

- Opening files
- Editing files
- Saving files
- Cutting and pasting text, numbers, and graphics
- Updating graphic images
- Recalculating floating-point and integer formulae

In order to make the performance difference visible, the macro puts up a bar chart representing the set of tasks that need to be completed. The elapsed time is displayed above the bar chart. When the macro is finished, the computer will beep and the clock will stop, displaying the total elapsed time. The Macintosh IIcx will finish in 38 to 41 seconds. The Compaq 386/33 will take somewhere between 45 and 57 seconds (usually around 52).

What is remarkable about this result is the fact that both machines are running a Microsoft application: Excel. Because Microsoft also wrote Window/386 and MS-DOS, one would assume that they have had every opportunity to tune performance of the MS-DOS version of Excel. Despite this fact, the demo runs faster on a Macintosh.

The Message:

This demonstration shows that system performance is more than a grab-bag of arcane "speed and feed" measurements. Real performance results from a delicate balancing act among the various components of a computer system's hardware (microprocessor, I/O structure, memory architecture), software (operating system, imaging model, file

system), and the user interface. Apple spends a great deal of its design energy trying to find that balance and as a result, Macintosh computers are faster than their clock speeds might suggest.

Caveats:

- We do **not** want to make the statement that Macintoshes are **always** faster than MS-DOS machines; they are not. If this demonstration macro did nothing but recalculate net present values, the Compaq 386/33 would probably finish sooner.

- We have not made a scientific attempt to replicate a typical computer session. We have simply included a variety of operations that we believe reflect average usage. One might argue that the macro is heavy on graphics or heavy on file access, but it is difficult to determine what the correct balance of operations should be.

- To make a fair comparison, the Compaq 386/33 should be configured with an 80387 math-coprocessor installed. The Macintosh IIcx comes with a co-processor standard. The 80387 is a $600-$1,500 option for the Compaq.

Setup

Hardware Requirements:

Set up your machines as follows:

- Macintosh IIx or IIcx with...
  - Color Monitor (Monitor Control Panel set to 256 colors)
  - At least 2MB of RAM
  - Control Panel: RAM cache set to ON at 512K
  - MultiFinder activated
  - Excel 2.2 installed
    - Set "Application Memory Size" to 2048
  - Choose a printer (any printer) with the Chooser

- A Compaq 386/33 with...
  - VGA or Advanced Graphics Color monitor installed
  - 2MB of RAM
  - Microsoft Mouse installed
  - 80387 Math Coprocessor chip installed and enabled
    - You need to use the Compaq Diagnostics disk setup to enable the chip after it is installed.
    - If you cannot obtain an 80387 chip, the demo will still work, it will simply take 5-10 seconds longer to run on the Compaq than it would with the 80387. The 80387 is an optional add-on to the Compaq, whereas an 68882 math coprocessor is standard on the Mac.
  - A 3.5" floppy disk drive (or access to one!)
  - A Hard Disk (ours had 84MB)
  - DOS 3.1 (or higher) installed in directory “C:\DOS”
    - Our tests were run under 4.0
  - Windows/386 installed in directory "C:\WIN386"
  - Excel 2.1 installed in directory "C:\EXCEL"
  - AUTOEXEC.BAT file should contain the following PATH command:
    - "PATH C:\WIN386;C:\EXCEL"
    - If you have installed Windows or Excel in different directories from those listed above, list them in the path command.
    - Include any other paths that your system requires.
    - The AUTOEXEC.BAT file that we used is included on the CD.
  - CONFIG.SYS file should contain:
    - "files=20"
    - "buffers=20"
    - "DEVICE=C:\SMARTDRV.SYS 512"
    - The CONFIG.SYS file that we used is included on the CD.
  - WIN.INI file should be in the C:/WIN386 directory
    - The WIN.INI file that we used is included on the CD.
  - COMPAQ.BAT and MENU.DAT should be in the root directory
    - These files are included on the CD (see below for installation).

- The configurations listed above are designed to make this as fair a comparison as possible.
    - Both machines are running at least 16 colors.
    - Both machines have 2MB of RAM.
    - Both machines are running a graphical user interface.
    - Both machines are using a 512K disk cache.
    - Both machines are running the most recent version of Excel (as of 2/15/90).

Setting up the Demo Software:

The demo has been delivered to you as 2 folders on a Macintosh-readable disk: "COMPARE4MAC" (containing the Macintosh version of the macro) and "COMPARE4CPQ" (containing the Compaq 386 version of the macro). These folders are identical except that the various spreadsheets and charts have been moved around so as to be legible on the two different screens.

Copying the Demo to Your Macintosh IIx or IIcx:

The Macintosh version of the demo is located in a folder on the diskette called "Compare4MAC". Copy this folder to the hard disk of your IIx or IIcx as you would copy any other folder from a CD-ROM. Also, if you have not already done so, install the Helvetica 36 font into your system.

Copying the Demo to Your Compaq 386/33:

1. Boot up your IIx or IIcx.
2. If it is not already installed, copy the "Apple File Exchange" folder to your IIx or IIcx hard disk. Copy the folder “Compare4CPQ” to your hard disk.
3. Open "Apple File Exchange".
4. Insert an unformatted, high-density 3.5" floppy disk into the Macintosh. After a pause, a dialog box will appear asking whether you wish to initialize the disk.
5. Choose "MS-DOS" from the list of disk formats and click on "Initialize". Initialization will take a minute or so...
6. When the Mac asks for a name for the disk, type in "COMPARE4" and press RETURN. You will then return to the "Apple File Exchange" dialog box with a list of folders and files from your Mac's desktop on the left, and the "COMPARE4" disk on the right.
7. From the list on the left side of the dialog box, find and choose the folder "COMPARE4CPQ" by clicking it **once**. The ">>Translate>>" button should become active at this point.
8. Click the ">>Translate>>" button. The files from the folder "COMPARE4CPQ" will be copied over to the MS-DOS formatted disk "COMPARE4" into a directory titled "COMPARE4.CPQ".
9. When the copying process is complete, click the "Eject" button on the bottom right of the dialog box to eject your new MS-DOS copy of the "COMPARE4" demo. You may return to the Finder on your Macintosh by choosing "Quit" from the "File" menu on the menu bar.
10. Boot up your Compaq 386/33 under DOS.
11. When the DOS prompt "C:" appears, insert the newly-created MS-DOS disk version of "COMPARE4" into the 3.5" floppy drive of your Compaq 386. [I will assume that this disk

drive is drive "A:" on your machine. If it is not, substitute "B:".

12. Switch to the floppy drive by typing "A:" and pressing ENTER.
13. Type "cd\COMPARE4.CPQ" and press ENTER to change to the "COMPARE4.CPQ" directory.
14. Type "INSTALL" and press ENTER to start the installation process. The batch file "INSTALL.BAT" will automatically create a directory name "c:\COMPARE4" on the hard disk of your COMPAQ, and then copy the appropriate files over. When it is finished, the DOS prompt "A:" will appear.
15. Remove the floppy disk from drive A and reboot the Compaq. To reboot, press the CTRL, ALT, and DEL keys simultaneously.

16. The demo is now installed and ready to run on your Compaq 386/33 hard disk.

Running the Demo Software

To run the demo, it is recommended that you position your Macintosh IIx or IIcx and your Compaq 386/33 side by side. Make sure both machines are configured as described above (under "Hardware Requirements"). Boot up both machines.

- **On the Mac IIx or IIcx:**
  Once the machine has booted up, simply open the "COMPARE4" folder and double-click on the icon titled "CLICKME.XLM". The demo should load and set itself up automatically. A dialog box with the question "Ready...?" will appear.

- **On the Compaq 386/33:**
  Type “Compaq” and press ENTER. This will start a batch file which will put you into directory C:/COMPARE4, load Windows/386 and load Excel. The demo will load and set itself up automatically. A dialog box with the question "Ready...?" will appear.

- To start the demo on both machines, press simultaneously the "RETURN" key on the Macintosh and the "ENTER" key on the Compaq. Press the keys only once. The demo will begin running on both machines.

  You *could* start the demo by using the mouse on each machine, but the "RETURN" and "ENTER" keys work just as well and avoid the problem of clicking outside the START button.

  If you choose instead the "QUIT" button from the "Ready...?" dialog box, you will be returned to the Finder or DOS.

  When the demo is over, the machines will beep and a dialog box with the question "What next?" will appear. The elapsed time will be visible above the pie chart/"clock face" on the right side of the screen.

- To run the demo again, choose "Setup Again" from the "What next?" dialog box (by clicking on "Setup Again" or simply pressing "RETURN"). If you wish instead to return to the Finder or DOS, choose "Quit".

  By choosing "Setup Again", you are asking the computer to close all files, and set up again at the "Ready...?" prompt. You may then run the demo again.

- Since results stabilize only after the demo has been run several times (especially on the Compaq), we recommend that you run the demo 3 or 4 times before the “real thing”.

Final Comments:

We have run this demo many times on both a IIcx and a Compaq 386/33. The IIcx takes from 38 to 41 seconds to finish. The Compaq takes from 45 to 57 seconds to finish. Not including an 80387 math co-processor in the Compaq may increase this time by 5-10 seconds. If your Compaq takes much longer than this, it may not be configured correctly and you are not making a fair comparison. In that case, you should reinstall Windows and Excel.