What's New in Computers

The Web PC

Vijnan Shastri

The Web PC might dramatically change computers as we know them! But, is it really feasible? Read on, to understand the pros/cons of the issue.

There's a lot of discussion today about the internet, the World Wide Web that is used on the net and the way it might alter desktop computing. The Web is expected to spawn many application and technology areas, both in software (Java is an example) and in hardware. In hardware, there is now a raging debate as to whether the PC as we know it will cease to exist in the coming years - to be replaced by the Web PC. Other names for this are the Web terminal, network computer, internet appliance etc. The debate, apart from technological reasons has important commercial implications as well. We'll see what this is all about in the following paragraphs.

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In its more than decade-old existence, the PC has managed to adapt to technological changes such as improved processor speed and storage capacity and take on new software operating environments such as Windows 95. Every time the death-knell was sounded for the PC, the designers tweaked with the architecture, came up with improved standards (such as the EISA improved Extended Industry Standard Architecture and the PCI - Peripheral Component Interconnect bus), gave it new capabilities such as the ability to handle multimedia and high speed graphics and the PC got yet another lease of life for a few more years. This of course was possible with matching increase in the capability of PC based peripherals such as displays, hard disks and CD-ROM drives. Above all, the PC is affordable and most important,

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one can get very sophisticated software at reasonable prices. The PC and the availability of relatively cheap software has also made it possible for computer technology to be pervasive as opposed to being costly and restricted to high performance machines. Moreover, today, the dividing line between Pentium class PCs and low-end workstations is very hard to define. Keep in mind that these PCs offer a lot more functionality and their cost (hardware + software) is a fraction of that of a workstation. PCs are also able to talk to each other through the telephone lines, send faxes and email and login to information servers through the internet in any part of the globe, all this of course at low transfer speeds. While these are all the positive developments, there are serious negative aspects to PC's.

Small LANs have become extremely popular even in very small organizations. Many of these LANS consist of PCs (clients) and a central file server which holds all the software and 'serves' the software to the clients on-demand. This makes the need for large hard disks on PCs, redundant. Further, PCs need to be constantly upgraded with hardware components (such as the motherboard, hard disk, display) and this is a continuous financial burden on the user. Add to this the cost of constantly upgrading the software.

Given that many PCs operate in a LAN environment, the operating system residing in these machines is not only unnecessarily bulky (like Windows 95) but is also (again unnecessarily) duplicated in each of the PCs. This is also true for application software and as a result makes it necessary to have large hard disks on each of the PCs. The growing complexity of PCs and their susceptibility to virus attacks makes maintenance and management of these systems a costly affair. This is the starting point for an argument for the WebPC.

The two important assumptions that proponents of the WebPC make are:

- A high speed network is available
- There are enough powerful machines on that network, to not only 'serve' all the software but to be capable of powerful computations as well.

The following would be the characteristics (*See Figure 1*) of a typical WebPC.

- A low-cost RISC microprocessor.
- No local hard disc or a very small one if it exists.
- High resolution display capability.
- High speed network connectivity (at least 25 Mbits per second)
- Will run a simple Operating System (referred to as a 'lightweight' OS)
- Will have a Java interpreter
- Optionally will have Video and Audio decoding capability,

  plug-ins for CD-ROM drives and hard disks.
- Will cost (its promoters claim) less than $500.
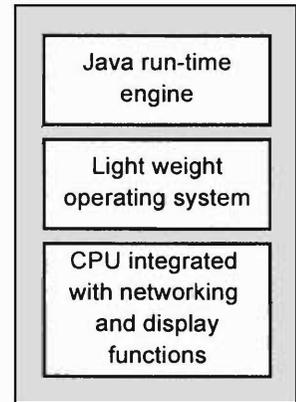
Those familiar with the X-terminal can immediately find similarities with the WebPC .

| Java run-time engine |
| Light weight operating system |
| CPU integrated with networking and display functions |

Figure 1 Components of a WebPC

The plus points of the PC	The minus points
• Relatively cheap and powerful environment.	• Has to be constantly upgraded - both hardware and software, thus imposing a financial burden on the user.
• A myriad variety of software is available, giving it a lot of functionality and making it tunable to the needs of the user.	• Maintenance can be complicated and expensive.
• User can choose a configuration (hardware) and buy software that suits his pocket, yet achieve results.	• Susceptible to virus attacks.
• It is independent - and does not depend on any other machine for its operation. This gives the user the freedom to use it the way she likes.	• Operating systems and applications are bulky, unnecessarily so for a large number of users. Further, they require large hard disks and maintenance skills from the user.
• Since it has been around for a long time, there is a lot of PC trained human resources available.	• Do not take advantage of high speed networks (if available).

The plus points of the WebPC	The minus points
• Will be a very cheap (under $500), simple 'terminal' kind of device. • Will entail almost no management / configuration headaches for the user. • Will not have to be upgraded frequently. • Software upgradation is not an issue since it is handled on the central server. Immediately applicable within organizations with high speed LANs	• Assumes the existence of a high speed communication network at every desktop - this is an unlikely scenario in the near future. • Management of huge centralized servers requires enormous investments. • Concentrates power in the hands of a few due to centralized server approach.

The Java environment (the Java language was discussed in *Resonance* Vol. 1, No. 5, 1996), which is one of the key issues in the WebPC, assumes that an application is divided into components. These components called applets will be downloaded (from a remote server) by the WebPC into its RAM only on an on-demand basis. This is in contrast to today's PCs which load the entire application into memory from the local hard disk. This entails that the PC be equipped with large amounts of RAM . Many parts of this application may not be used at all during the session. Take the example of a typical word processor running on Windows. The entire package consisting of the formatting tools, drawing tools, spell checker etc. is loaded into memory. The WebPC on the other hand will load these tools (implemented as applets) only on an on-demand basis from the remote server. A similar concept exists for the PC environment and this type of software is called 'component-ware'.

Application components in Java will be downloaded by the WebPC only on an on-demand basis. This is in contrast to today's PCs which load the entire application into memory from the local hard disk.

Since the demands on the WebPC in terms of capabilities are low, the user will not have to worry about upgrading it as often as he/she did with the PC. Due to the simple structure, maintenance costs will be very low. Furthermore the Java environment moves the burden of maintenance and configuration of software to the server - away from the user with the result that administration costs at the user-end are

virtually zero. Software upgradation for instance, needs to be done only on the server before one uses the new version (after paying the costs of course!). Will the Web PC really replace the desktop PC? There are many questions both technological and economic which need to be addressed before we decide the future of the WebPC.

The first assumption made in the WebPC environment, that high speed networks will reach every desktop, is 'easier said than done'. It requires huge investments in terms of capital costs and it is technologically a mammoth task to install high speed networking switches and communication links to handle all the data demands of the WebPC on every desktop. Although speeds of communication networks are increasing by the day, it will take a while before they reach speeds demanded by the WebPC.

Many have doubts if the WebPC hardware can be built at a cost under $500. Unless the price is of this order of magnitude users would not think of replacing their existing PCs. Since the WebPC will have only a Java interpreter (vs. running compiled code on a PC) and hence will be inherently slow, many doubt that enough computing power can be packed into it at this price. With 3-D graphics applications becoming a reality in the coming years, this will place phenomenal computing burdens on the servers and also result in data traffic on the network. There is also the issue of network security: since the WebPC relies on a centralized system, a computer hacker can create total chaos for a large number of users if he manages to break-in. This is unlike the PC where the virus (although communicated through floppies or networks) attacks only the PC on which it (the virus) is running. One will have to develop Java applications with capabilities better than the PC-based applications. There is also the issue of the portable PC market which is growing at a very fast pace. It is unlikely the WebPC can make a dent in the portable market in the near future since high speed wireless

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connections is a concept far into the future. The cost of installing and running the servers also cannot be ignored.

However where the WebPC can succeed is at an organizational level where high speed LANs are already in place. WebPC protagonists hope that this environment together with the rapid acceptance of Java will be the 'launching pad' for the WebPC. Commercial companies like Sun and Oracle, backed by IBM, have come up with the concept of the WebPC and are promoting it strongly. Sun has a strong presence in the workstation market and Oracle in the database market. Microsoft is perceived to be anti-WebPC since it has a lot at stake in the PC market. Microsoft's competitors also regard this as an opportunity to break the dominance of Microsoft over the PC market.

In developing countries, where communication networks are very poor, the PC certainly appears to be a better solution to solve computing problems (albeit partially) since it can be distributed and one can build machines with the not-so-latest hardware and software and yet achieve some results. Also, communication links to international networks are very expensive and only a handful of organizations have this facility today. In some sense the WebPC relies on the central computing paradigm (with its political ramifications) whereas the PC is of a distributed computing nature.

In this article we have tried to examine the major issues behind the concept of the WebPC. Like all products in the information technology arena, the success or failure of the WebPC will depend on the response of the market-place rather than the technology alone.

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Suggested Reading

The Bill Gates interview. *Economic Times*, December 11, 1995.
Tom R Halfhill. Inside the Web PC. *Byte Magazine*, March 1996.