Operating systems for DVRs

If your life was dependant on a life-support machine that runs on Windows 98 would you be comfortable?

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Today, computers and the software they are running on are an integral part of most businesses. Much like a photo-copier, the company car or filing cabinets, businesses recognize computers as a necessary tool to make the business work.

Unfortunately, most businesses are not in a position to make as informed a decision on computers as on other needed tools. This is because computer systems are more complicated than other business choices.

Most businesses today are running a mix of computer types and computer operating systems to get their work done. For example, Intel Pentium and equivalent computer systems running Windows 95/98, NT or 2000, are very common on office desktops but other types of computers may be used for graphic artwork, point of sale systems or connectivity to the Internet. In fact, it is very possible that you are not even aware of what type of computer hardware and operating system is contained in a dedicated system performing a specific function for your company.

This is also the case in CCTV, where in the latest flood of digital video recorders we have a variety of operating systems. Many choose to ignore the fact that DVRs are slowly but surely replacing matrix switchers, but this is happening right now and we need to pay special attention to the choice of the operating systems used in such DVRs.

A security system needs to be what the name implies - stable and secure.

Unlike the general day-to-day usage at home, or in the office, where you shut down your computer after the busy day you've had, in security and CCTV the DVRs are supposed to work 24hrs a day, 7 days a week, 365 days a year.

Many DVRs today run on Windows 98, and some even on 95. The question imposed is "How confident can we be that Windows 95/98 is a good choice for a DVR operating system?"

If your life was dependant on a life-support machine that runs on Windows 98 would you be comfortable? If the answer is no, you'd better then have a serious think about what you are putting in your security systems.

Very often large sums of property and even lives may depend on such a security system.

I will be honest and say that my experience shows that I can trust Windows NT a bit, and maybe more Windows 2000, but definitely not Windows 95 or 98. The reasons are simple - 95 and 98 are based on the old DOS file structure and they

are not true-multitasking systems. The memory sharing of various programs make it very unstable and even dangerous. If one application crashes, the whole system goes down. Windows 95/98 are made by Microsoft in order for people to slowly migrate from DOS programs and games to something that is a bit more of a real operating system - NT. Although the NT stood for "New Technology," the idea was based on UNIX concepts which were widely used in the more serious industrial and scientific community for many years. And while people were migrating to Windows 98, Microsoft didn't improve NT to what it should be, but started developing a new OS - Windows 2000. Is this really a better operating system

or just another revenue maker for Microsoft? When you consider that Microsoft is now coming up with even "better" OS - the Windows XP, the latter is the correct conclusion.

How many times have you experienced a GPF (General Protection Fault) on your Windows 95/98 machine? How many times have you seen the BSOD (Blue Screen of Death) on your Windows NT PC? How many times have you had to re-boot your system after lock-up, even with Windows 2000?

How many hours or days have you or your friend spent re-installing your operating system, after it has crashed and lost the boot record? Do you think that this is what computers were designed to be and accept it as normal behaviour? Well, you shouldn't. Computers are designed to be smart and user friendly. If they are not, it is the software and hardware engineers that have designed them badly. And, unfortunately, if there is only one software company writing operating systems for the masses, such as Microsoft, you will have things done only the way they think is the right way. There is no progress without competition.

I, for one, am still preparing this magazine on a Windows2000 PC, which after a few years now (I have been using Win 2k since the end of 1999), I have tuned it into a reasonably stable machine, or at least I know what to avoid not to crash it. I must admit this is now a much more stable machine when compared to the previous Windows 95 or 98 I used. And this "non-crashing tune-up" is done most of the time with trial and error. I have had so many different PCs, and none of them worked without any problems after the installation. There were always incompatible drivers, IRQs, strange conflicts, etc.

I once measured the time for bringing a dead machine up to the configuration I had, and that is by knowing all the settings, IRQs, latest drivers at hand, etc. It took me literally two 12-hour days. This included the time needed to physically load Windows, re-booting times and installing all the software needed. Install, restart, install, restart, adjust, restart, and so on. And who will pay for such lost time? Should we send the invoice to Bill Gates? Maybe, since we are paying for his products which don't perform the way they are supposed to.

Thanks to one small non-Microsoft program called "Ghost" (which should have been produced by Microsoft in the first place and incorporated into every Windows) I learned how to save precious time and nerves. This is a New Zealand made program (now owned by Symantec) which requires only one floppy diskette that you can boot from in order to backup your partition with the operating system onto another one. This is not Backup as Microsoft has designed it, i.e.. you have to be in Windows to make a backup and restore it (and what happens if you can't get into Windows?). Ghost makes an image of the complete bootable partition, together with the boot loader section, file allocation and partition information so that in the case of a system death, you can easily copy your last backup onto any partition and get the same system running as before the crash. It only takes up to half an hour to restore it, instead of 2 days (!). What a life saver.

Often, after so many crashes I have experienced, usually working on something very important, such as the "CCTV" book, or even this magazine, I have asked myself "Why do I have to go through such stressful computer use?" I have tried and used all available (Microsoft and non-Microsoft) tools for backup and recovery (just how many times have Windows changed the format of their backup - nobody seems to know). None of those seems to beat the small Ghost program, which fits onto one floppy diskette! I have always asked myself - "Why doesn't such a simple program come with every Windows?" Perhaps Microsoft is either not aware of the problems people have (which would mean they live in an isolated world of their own empire) or they are over-confident of the quality of their operating system (which is totally unjustifiable and wrong).

In a way, my disaster recoveries solution with Ghost made me stop thinking about the real reasons for my computer crashes, until last year when we saw a plethora of DVRs coming out on the CCTV market. Many of them use Windows 98, and almost all of them (!) had stability problems. In order to circumvent potential problems some brands even suggested daily re-booting schedule for their machines (!). Personally, I don't think this is an acceptable product for a security system. If I was the owner of an expensive business which is protected by such a recorder I wouldn't trust the DVR and couldn't sleep comfortably knowing that my property is not well protected.

As editor of this magazine, and a CCTV Consultant, I feel obliged to raise the issue of operating systems and their reliability, especially when they are used in 24/7 environment such as CCTV. No matter how often we have said that the CCTV technology has many similarities with the broadcast television, there are at least two very important differences:

The first is - digital compression techniques in CCTV are concentrating on higher image compressions, yet preserving usable quality (this is how Wavelet and some other compressions were invented).

The second is - the long term continuous operation of the equipment, very often un-manned. One thing is to have VCRs and multiplexers left working continuously (basically just replacing tapes at regular intervals) and another is to

have a computer crunching heavy numbers all day long.

So the big question is: which operating system would be a good choice for reliable digital video recorders?

Clearly, many readers would say - Windows of course. But do we really have no alternative?

Well, this is definitely what Microsoft want you to think.

Please don't understand me wrong here - I am not against Microsoft. I am a user of Microsoft products also. But I am against the limited choice we have imposed on us and the monopoly Microsoft has, for which we pay, over and over again.

With the new Windows XP (coming out this October) even the methods of how you pay for your OS will change (but you will not avoid paying for it, and for every version that will come after). Users will have a choice of paying a full price or leasing the OS so that you ensure Microsoft has a continuous income. Furthermore, a license that you may buy (or lease) will only apply to the hardware of your machine. If you decide to change your hard drive, or install a new video card, you may find it can not be done without contacting Microsoft. This is nothing else but pure monopoly. In actual fact Microsoft is the owner of your operating system all the time.

Luckily, there are some better and (surprise!) cheaper alternatives.

Many already know about the Mac OS X, although I haven't seen a DVR based on Mac OS yet. I have seen the new OS X and it is a real stunner with its sleek appearance. Just go and visit http://www.apple.com/macosx/theater/ and you will see "science fiction" of a beautiful and functional GUI. But not only that, being based on the UNIX core, it is a very stable OS, directed towards heavy image and video processing, which is the main area of the Macs superiority. This sounds ideal for CCTV digital video recording applications, but we'll wait and see if any manufacturer will yet come up with a DVR based

on Mac OS X.

Another very interesting OS, whose author has been closely associated with Apple is BeOS (short from Better Operating System). Started in 1996, BeOS was designed from scratch as a true Media OS. It is based on a 64-bit file system, thus pushing the limits imposed by the old 16-bit and even 32-bit file systems. Also, BeOS is designed to easily harvest the benefits of multiple processors. BeOS is reasonably young, but it seems to be very powerful and "cute" OS. If some DVR manufacturers decide to use it as a basis for their DVR, it could be a very good choice since the BeOS design is specifically for image processing intensive applications. BeOS is a low cost (the professional version) or free (personal version) operating system, specifically designed for heavy graphics, video and image manipulation. You can visit and download it from www.be.com. This is a very compact OS (My download was only 50MB), which can easily be installed even as a Windows folder, which when activated re-boots your machine and takes it over. The video clips I have seen on this OS are nothing short of the DVD video quality, and the file size for 5 minutes of such video was 1/10th of the equivalent

AVI file. I was amazed with the speed and quality of playback of a 1.5GB AVI file I had on my PC.

Another operating system that I would like to pay special attention to is Linux (pronounced as "Lih-nucks"). Linux is bringing about a quiet revolution to the IT world .

Linux is a UNIX-type operating system created by a Finnish student in 1994, who was looking for an alternative to Windows. Named after the creator - Linus Torvalds

- it is part of the steadily-growing community of Freeware. That is, it is available free to everyone to do with it as they choose and can be downloaded from the Net.

It is perhaps the most novel development of its kind, especially in a world fighting over intellectual property rights.

When Linux was put on the Internet and its source code made freely available, the creators made it known that anyone is free to make changes and improvements on it. The idea quickly caught on and Linux today is the creation of literally thousands of programmers all over the world. It is difficult to think of many such products that are the outcome of such a wide and such an open collaboration.

There are no strings attached with using the product, but one: It is available for free but companies and developers can charge money for its distribution. However, their version of the distribution must contain the source code (that is, the internal programme should remain open and available to everyone).

Also, unlike Windows whose uptime (the time for which it runs without crashing) is counted in days, Linux is known for its bullet-proof reliability and its performance in almost all respects is better than Windows NT or other UNIX-like systems when running on Intel processors. This explains why over 48 per cent of all the Web servers on the Internet are running Linux today. That's close to all the other operating systems put together, including Solaris, NT and Netware. If it is connecting to the Net, Linux is, by far, miles ahead.

Hundreds of software developers are now writing free software for Linux most often with better quality than commercial software. Applications range from scientific and financial software to standard Office Automation software.

Some computer-users believe there is no viable option to Microsoft programmes like Word and Excel. That is a myth. StarOffice 5.2 by Sun Microsystems, for exam-

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There are already a few DVRs on the market based on Linux, and they are real proof that stable and better non-Windows OS do exist.

While Linux development was started on an Intel 386-based system, the philosophy of inclusion meant that other architecture were considered. Today Linux runs on SPARC, PowerPC (including Mac), Digital Alpha and many other machines with ports on the way for others, as opposed to Windows which is mostly for Intel based machines.

I have been involved in the design of many DVR systems, and one of the first in Australia and probably in the world for that matter, was based on Linux DVRs. Then, I heard about Linux for the first time and had reservations, but after extensive trials and testing it was decided that the system satisfies all of the system design requirements, so it was accepted and installed. It is now nearly 4 years since the system was installed and it has not stopped recording or crashed once. This is nearly 1400 days (nearly

200 weeks so far) constant recording and play-back non-stop.

I wonder, what would be the maximum up-time when a Windows 95/98 is used? One thing I know, my PC locked-up after 49 days of just being turned on. Later on I found sound information on Microsoft's web site that they had a bug which shows up after 49 days of constant operation! The graph below was taken from Microsoft's own web site and deserves a serious thought.

Imagine what would happen on a Windows 98 based DVR, which has to go through scandisk process

Mean Time To Failure
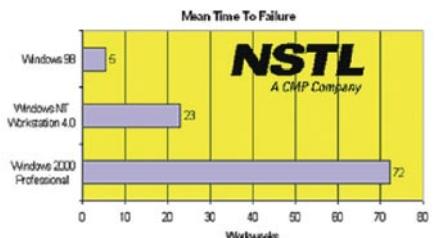
if you shut the power unexpectedly. And let's assume this DVR has 320Gb internal hard drives (4X80GB, which is not uncommon these days). Just the time required by scandisk to go through all the drives may be prohibitive

for a security system. And what if scandisk finds a disk error?

Windows NT and 2000 are fundamentally different to 95/98 and are more reliable, but only time will tell how more. I haven't seen a DVR based on 2000 yet, but there are a number of DVRs out on the market which are pretty stable with NT. While talking to some manufacturers that use Windows NT - they have admitted that they have many software engineers doing nothing else but working on finding and fixing bugs in NT, so that for them, even NT Service Pack 3 is now more stable with their DVRs than it is if they would use the latest NT Service Pack 6. Others have admitted that in using Windows NT in their DVR design they have completely taken over Microsoft's disk and file handling, hence the reason for their DVR stability.

Some programmers say that Windows 2000 was shipped with over 60,000 known bugs. It is also said that there are 6 Million lines of code in Windows 2000. This means there is a bug every 100 lines of code!

Linux works to standards that are established by groups of competing companies. Although they are competitors, they realize the need for standards. Microsoft does not have standards in the true sense of the word, they are generally proprietary. They do not even follow well-defined standards that they agreed to.

Linux as well as most of the associate programs were designed by people for themselves. They had a particular need and developed something to solve the need for themselves. There was no "marketing strategy" behind the products, but only solving a problem. Things were made simple to use, as compared to looking "pretty" because the developers wanted functionality and were not trying to sell it. In addition, since the programs are designed and programmed by the actual users, there is a very strong motivation to get it right and correct problems quickly (as they have the same problem themselves.)

Being software for and by users, there's no marketing-hype, smoke, or mirrors to mislead user-expectations. When a feature is missing in Linux, it's discussed among the users and programmers and not marketing. The decision is made based on the true usefulness of the feature and not how marketing can sell it. Linux is free. You are free to copy it all you want. You are free to change it all you want.

Microsoft's use of existing technologies and standards is something they call "embrace and extend." However, what these alleged extensions do is to break the compatibility with other system that use the true standard. A prime example of this is Java and Netscape.

"Sometimes you want or need to just upgrade a single component. Microsoft's monolithic structure does not allow this. Although there are patches and service packs to correct problems, you cannot upgrade specific components (e.g. the User Manager or Windows Explorer). Instead, you are forced to upgrade the entire system. This cost money both in terms of the software and the time spent upgrading the software," a Windows programmer says.

With each new version of Windows more and more expensive hardware is required. Although HW prices have dropped dramatically in recent years, having to buy more hardware just to upgrade the operating system (or applications) means real money out of your pocket. Linux does not require hardware upgrades when a new version is released and many Internet sites are working successfully on 486/33 machines with as a little as 16MB of RAM. Linux code is more compact and more efficient.

With no additional programs running, Windows NT needs over 20 MB of RAM, and Windows 2000 32MB.

A well known network administrator of both Linux and Windows NT has the following to say: "The biggest thing we have encountered with Windows is configurability. Have you ever tried to find something in the Windows registry let alone change it? Volumes have been written on how to work with this and it is still very complicated. Add to the fact that one screw up and your system won't even boot. With UNIX, the majority of the configuration files are all text files and straight forward to change. Plus you don't have to re-boot every time you do something as basic as adding a new TCP/IP address or changing a
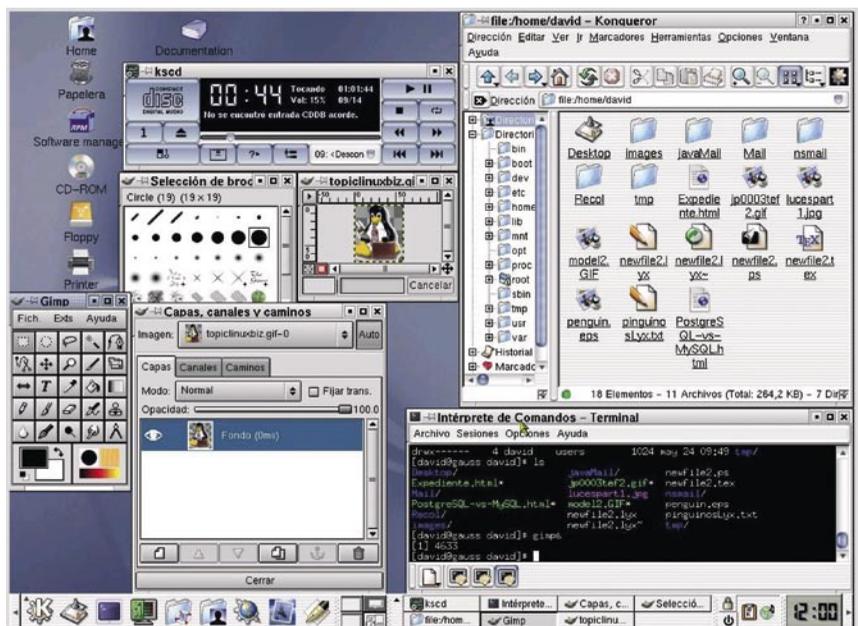
Linux-Mandrake screen capture

route. Linux
even allows you to add drivers to
the running kernel."

When trying to shutdown NT I frequently get the message that a program is not responding. However, there is no name in the title bar, so there is no way to figure out which program is not responding. Often, I find that MS-Word (or some other application) is not responding (also shows in Task Manager as not responding). This happens, even if the file I am editing is on the local hard disk, so it is obviously not a network problem. I then let it sit for a long time (over an hour), and I still get no response. I then pull up Task Manager to kill ("End Task") that one process and it kills all of my MS-Word processes, not just the one that I told it to "End task." Windows is doing what it wants and not what you tell it to.

Helen Custer says this in her Microsoft Press book Inside Windows NT: "NT is designed as a file and print server. Despite the fact that certain applications (particularly databases) run "on behalf" of a user, NT is not a multi-user system. If you have 10 people running an application on 10 Windows PC, there are 10 copies of it in memory (one per PC). If a similar application is running on a Linux machine and users are accessing via X, there will only be one copy in memory. The Linux memory management will keep track of the text segment/region so that it is shared among all the users. This means less total memory for the system. In addition, NT client machines must load the entire program into memory (not counting DLLs), whereas Linux just brings in what is needed. This means the total memory requirements for the system is even less."

A year or two ago, some Linux opponents have commented, and this was my opinion at that time too, that Linux was very difficult to install. You had to know Unix command language to do that. One year later, with the Linux distribution competition increasing, this is no longer the case. Linux installation is so easy and automatic, even easier than Windows. There are a few different flavours of Linux, RedHat, SuSe, Mandrake, etc. They are all based on the same kernel, but offer different GUIs and freeware programs. I have recently downloaded Linux Mandrake 8.0 from their web site www.linux-mandrake.com and I had a smooth installation on two computers, even with network and internet connections established much easier than with Windows 2000. I even installed Star-Office 5.2, and was able to read all Office

documents, including Power Point, Word, Excel, etc., and even save files in those formats.

Linux works with various GUIs which have different appearance and functionality. The core of the Linux operating system (called kernel) is the same, and the users have a choice of a few different desktops. The KDE2 is now the popular one, but so is the Gnome.

For people that are used to Windows environment, there is a GUI for Linux that looks just like Windows. Even Windows software simulators are available so that you can run your favourite Windows programs under Linux.

The bottom line is - Linux is more flexible, faster, more stable, better updated, and free. I don't mind using Windows 2000, or even maybe XP, because of the programs I have, and because I know how to fix my own little lock-ups. At least for the next year or two. But I can not recommend it as a long term reliable solution for recording in the CCTV systems. I know there is a better alternative.

Frankly, I am sick of buying a new operating system every year and learning how to cope with its problems over and over again, only to find that Microsoft has a new and "better" OS waiting around the corner. Their new operating systems should really be called Upgrades and distributed for free since we have all paid five-fold in the last five years (95/NT/98/2000/Me).

Linux has open source code and there are hundreds of programmers tuning it out there. Linux was designed by programmers sick of Microsoft problems and monopoly. Pure logic says that in the long run, it has to be a better solution than Microsoft's way.

All intelligent machines based on computers that are being built now and in the future will have to rely on the most reliable OS possible. This can only be done if such OS is an open standard continuously adjusted and improved by international experts (programmers). In the same way the technical standards are being produced and agreed to. When one company controls such a development I am not convinced that any standards or improvement are done in the best possible way. Maybe, one day Bill Gates will decide to make the Windows OS source code open to others and consequently produce a real "Winning DOS" - an operating system for the masses that made him rich.

I somehow feel that "aint gonna happen."

Isn't this a good enough reason to consider Linux more seriously, not only for CCTV but also for daily use as well? □□□