MS-DOS vs DR-DOS Comparative Review

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A Comparison of MS-DOS 6.2 and DR-DOS 7

Overview

This document provides a comparison of MS-DOS 6.2 and DR-DOS 7. Because DR-DOS 7 is not yet a shipping product, information on DR-DOS 7 in this document is based on reviews published in trade publications, public Novell documents and conversations with Novell personnel. **However, the final product could differ significantly from what we present in this comparative review. The information included in this document is accurate to the best of our knowledge at the time it was prepared.**

Based on what we have been able to learn coupled with recent Novell announcements, DR-DOS 7 combines Novell's desktop operating system, DR-DOS, and an upgrade to their peer networking product, Netware Lite 1.1 which Novell renamed Personal Netware.[1] Because of the lack of integration in DR-DOS 7 between their desktop operating system and their peer network, the most accurate and easiest way to view the product is to break it into the DR-DOS and NetWare Lite components. The balance of this comparative review will analyze the strengths and weaknesses of these components relative to the comparable MS offerings; namely, MS-DOS 6.2 and Windows for Workgroups (WFWG) 3.11. Hopefully this stand-alone approach will help to highlight the key features and distinctions of these competitive operating system and peer networking products.

Executive Summary

Key advantages of MS-DOS 6.2 and Windows for Workgroups over DR-DOS 7 and Netware Lite include:

- More compatibility
  - MS-DOS standard ensures broad industry support and lower support costs
  - ISVs and PC OEMs test and develop applications with MS-DOS
  - Clear future migration path for users
- More safety
  - New data protection technology makes DoubleSpace safer than DR-DOS' solution
  - Features like ScanDisk and DoubleGuard provide an extra layer of protection for data
- More conventional memory for MS-DOS applications
  - MemMaker optimizes *all* TSRs and device drivers to maximize conventional memory
- More tightly integrated with Windows
  - Optimized to run with Windows and Windows for Workgroups 3.11
- More compelling benefits for peer and large corporate networking users
  - MS-DOS is a universal client and all networking products including Netware and Netware Lite/Personal Netware run successfully on MS-DOS
  - Windows for Workgroups includes broad connectivity support for multiple networks while Netware Lite client is designed for Netware family.
  - Windows for Workgroups 32-bit architecture improves performance significantly while requiring only 4K of conventional memory
  - Extension of Windows family ensures compatibility with Windows applications

Operating System Comparison: MS-DOS 6.2 vs. DR-DOS 7

Compatibility

[1] The product offers only two real areas of integration: installation and security. As a separate product, users can run Netware Lite runs successfully on both MS-DOS and DR-DOS.

During the evaluation of a new operating system, customers must weigh one very important criteria against the benefits of the features and technology offered by a new product: compatibility. Microsoft's fundamental belief with MS-DOS is that *if it's not completely compatible, it's not MS-DOS*. We learned from MS-DOS 4 that when compatibility becomes an issue, users were dissatisfied. Thus, our vision for MS-DOS 5 and 6 focused on delivering a solid product to PC OEMs and users that offers compelling features without sacrificing compatibility.

We achieved our vision of delivering compelling products that preserved compatibility by testing extensively with key ISVs, PC OEMs and end-users and taking extreme care when we modified the MS-DOS kernel. In addition, hundreds of books and videos as well as thousands of trained professionals all leveraged the MS-DOS infrastructure to provide customers with information to help minimize support costs. Our customer satisfaction data showed over 90% satisfaction with MS-DOS 6 and our product support data indicated that MS-DOS 6 received fewer support calls than any of Microsoft's top 10 products. In extremely rare cases, though, users did experience serious problems. We took this very seriously and responded with MS-DOS 6.2 which provides users with even greater protection for their data.

In contrast, Novell's approach with DR-DOS does not appear to have achieved complete compatibility. A consequence of this is that DR-DOS has a history of compatibility problems. DR-DOS 6 suffered from compatibility problems as evidenced by at least 6 patches shipped for the product. This presents a significant problem for users because too many operating system updates becomes very expensive to administer on desktop PCs. Novell has already confirmed that DR-DOS 7's multitasking feature is incompatible with Windows in Enhanced mode. PC Week also reported that DR-DOS 7 is likely to break third-party memory managers. In addition, Novell recently indicated that DR-DOS 7 is also incompatible with Windows for Workgroups 3.11 even after Novell received its first beta of Windows for Workgroups earlier this year. This is a major concern since approximately 30% of all new PCs shipped in the next 12 months will ship with this new version of Windows for Workgroups. The history of these incompatibilities also suggests why DR-DOS has not gained a significant presence in either the retail, VAR and PC OEM channels. Although DR-DOS 7 is a significant improvement over DR-DOS 6 in terms of features and technical advancements, it continues to lack broad industry support. We believe users will be concerned about the problems described above.

Summary of Strengths and Weaknesses

Key points about MS-DOS 6.2:

- **Pros**
  - **Very broad PC industry support**
  - **Extensive testing effort by Microsoft, ISVs and PC OEMs ensures compatibility**
  - **Industry standard operating system reduces training and support costs**
  - **Optimized to run with Windows and Windows for Workgroups**
  - **ScanDisk provides an integrated disk analysis and repair tool.**
  - **New DoubleGuard technology provides additional layer of protection for DoubleSpaced drives.**
  - **MemMaker memory optimizer enables users to easily get more memory for their MS-DOS-based applications.**
  - **SmartDrive caches CD-ROM drives providing significant performance benefit (15% or greater depending on application and function performed).**

- **Cons**
  - **Multitasking for MS-DOS-based applications available only with Microsoft Windows.**
  - **Support for protected mode drivers available only with Microsoft Windows.**

Key points about DR-DOS 7:

- Pros
  - DPMS (DOS Protect Mode Services) versions of several drivers (disk cache, CD-ROM extension, disk compression and multitasking drivers) enable protected mode execution and help to maximize conventional memory for both MS-DOS and DR-DOS users.
  - Multitasking enables running of multiple MS-DOS applications.
  - User-level security model provides protection for customers' systems.

- Cons
  - Acknowledged incompatibilities discussed above.
  - Less third-party testing and support. This could present a significant support problem for customers.
  - DPMS API lacks industry support. No memory optimizer available with the product.
  - Multitasking is incompatible with Microsoft Windows in 386 enhanced mode and most third-party memory managers.
  - No clear future migration path for customers.

Major Features Review

Disk compression
In DR-DOS 7, Novell has chosen to replace the SuperStor disk compression in DR-DOS 6 with Stacker. This was probably a good decision on Novell's part given SuperStor's consistent portrayal as a second-tier compression product by independent reviewers. However, it presents DR-DOS 6 users with possible migration issues and forces them to learn a new compression technology. A consequence of this learning is higher training and support costs. In addition, it's unclear how well integrated compression is with the operating system. To be fair, Stacker and DoubleSpace share many of the same features; including uninstall and automounting. Although Stacker supports compressed floppies on any PC and password protection, the checksumming and surface scan don't provide the same degree of safety offered by DoubleSpace's DoubleGuard and ScanDisk.

Memory Management
DOS Protected Mode Services (DPMS) enables users to run drivers and TSRs in protected mode. Novell has provided DPMS drivers for several though not all of the utilities in DR-DOS 7. This technology is beneficial because it provides users with more conventional memory. However, it seems that it's three years late. Currently, DPMI is the standard. The VxD protect mode driver model in Windows supports this standard and is the basis for a new, more powerful protect-mode standard. The VxD model is a core part of Windows and Windows for Workgroups and will be supported in future Windows releases as well. To date, there are *over 300* independent hardware vendors which have developed VxDs for Windows. These may not work with DR-DOS 7. DPMS requires developers to write programs that support the DPMS API before users can take advantage of its benefits. Its not clear why developers would do this in light of the DPMI standard and the VxD protected mode driver model supported by Windows.

DR-DOS 7 doesn't include any memory optimization program like MS-DOS 6.2's MemMaker. While DPMS provides support for only a handful of device drivers, users can get more conventional memory by using either MemMaker or third party memory managers to optimize *all* TSRs and device drivers. This means that DR-DOS 7 users must purchase a third-party memory manager to get the same amount of conventional memory. Ironically, these memory managers are apparently not compatible with the new multitasking feature discussed below. Microsoft's MemMaker provides easy and safe memory optimization for all users while allowing the flexibility for advanced users to customize their systems. MemMaker is generally regarded as providing comparable memory optimization with better ease of use and safety than the third-party memory manager utilities available.

Multitasking

On the surface, the multitasking feature in DR-DOS 7 appears to be a technological gain. However, today users have an easy way to multitask applications: there is Windows or a product called Desqview. Nonetheless, multitasking in DR-DOS 7 raises serious compatibility issues. While it does allow multitasking of MS-DOS-based applications, Novell acknowledged that their multitasking is incompatible with Windows in 386 Enhanced mode. In addition, PC Week reports that multitasking will probably break third party memory managers.

Disk Analysis and Repair Tool

MS-DOS 6.2 includes a new disk analysis and repair tool called ScanDisk. ScanDisk diagnoses and repairs errors on both DoubleSpace and uncompressed drives. Its features include:

- Crosslink and lost cluster detection and resolution.
- Repair of damaged certain damaged portions of Compressed Volume Files and recovery of data.
- Hard disk surface analysis and marking of bad sectors while "hotfixing" the disk by moving data from the bad sector to a good sector.
- Ability to undo any changes made to the hard disk.

DR-DOS 7's Stacker disk compression comes with a limited surface scan for Stacked drives only. It doesn't have a utility with the breadth of diagnostic and repair features available with ScanDisk.

Other Features

Novell, following the MS-DOS lead, has added two new utilities in DR-DOS 7: Backup and Anti-Virus.

- **Backup:** Novell has licensed Fifth Generation Systems' Fastback Express, a subset of their Fastback Plus product, for DR-DOS 7. Micorsoft has licensed Microsoft Backup in MS-DOS 6.2 from Symantec (Norton Backup). Norton Backup has received numerous awards for its backup technology and ease of use. Microsoft Backup leverages these strengths. Norton's Backup also received higher marks for ease of use compared to Fifth Generation's Backup. MS-DOS 6.2 provide MS-DOS- and Windows-based versions of Backup. Though Microsoft Backup doesn't include support for tape drives, users receive these drivers when they purchase tape drives.

- **Anti-virus:** Novell has also licensed the anti-virus utility, Search and Destroy from Fifth Generation Systems for DR-DOS 7. Microsoft licensed Microsoft Anti-virus from Central Point Software, a leader in anti-virus technology. Software Digest Ratings Report picked Central Point's Anti-virus as one of its recommendations while citing Fifth Generation's Anti-Virus for focusing on the hard disk and not catching floppy disk viruses. MS-DOS 6.2 includes both MS-DOS and Windows versions of anti-virus.

Other utilities included in both MS-DOS 6.2 and DR-DOS 7are:

- **Undelete** - MS-DOS 6.2 has both DOS- and Windows-based versions. DR-DOS 7 includes a DOS version but uncertain about a Windows version.

- **Disk cache** - SmartDrive, the disk cache in MS-DOS 6.2 also caches CD-ROM drives; DR-DOS 7 has a DPMS disk cache.

- **Disk defragmenter**

- **CD-ROM extentions** - DR-DOS 7 offers a clone of Microsoft CD-ROM extensions and include DPMS support.

In general, utilities included in DR-DOS 7 are different from those in MS-DOS 6.2. Users will need to learn and support non-standard technologies when adding DR-DOS to their MS-DOS-based computing environments.

Networking Comparison: Windows for Workgroups 3.11 vs. Netware Lite

A True Universal Client

In this part of the review, we discuss the importance of MS-DOS and Windows in the networking environment. Although MS-DOS doesn't bundle networking, it nonetheless serves as the universal client for the hundreds of networking products available all over the world. As network vendors evolved their solutions for both large and small environments, they all have one common thread: they run successfully on MS-DOS. With MS-DOS as the universal client, this allows users to keep their systems open and makes it easy to grow existing networks as the need arises. Networking vendors also benefit because they can easily leverage the MS-DOS infrastructure and test their products extensively thus ensuring compatibility with applications and hardware.

Today the focus on developing new user interfaces, and hardware and software technologies is in a Windows environment. Now that Windows is the standard in a protect-mode environment, it is quickly assuming the role of the universal client for networking products as well. This means that our Windows family needs to operate seamlessly with other vendors' networks. Thus we've improved Windows for Workgroups to operate seamlessly with products like Novell's Netware by providing a 32-bit IPX/SPX compatible protocol and included support for the TCP/IP protocol standard to ensure broad connectivity support for other vendors' networks like DEC PATHWORKS, Banyan VINES, and LAN Server. In addition, as part of the Windows family, Windows for Workgroups leverages the Windows architecture. This means that users can install and use Windows for Workgroups easily. Recognizing the importance of Windows, it's essential that users understand which real-mode operating system is optimized to run with Windows. An operating system that isn't tightly integrated with Windows might prevent users from benefitting from new technologies in networking or workgroup applications like Microsoft Mail or Lotus Notes. The tight integration also ensures a smooth migration path for future releases of Windows. With Novell's acknowledgement that Netware Lite is incompatible with Windows for Workgroups or that certain features in DR-DOS 7 are incompatible with Windows, it appears once again that Novell is not ensuring complete compatibility for both MS-DOS and Windows users.

Summary of Strengths and Weaknesses

Key points about Windows for Workgroups 3.11:

- **Pros**
  - **Easy to install and use since it builds on Windows 3.1**
  - **Broad connectivity support for other vendors' networks**
  - **32-bit disk access and file system drivers which means performance gains of up to 150%**
  - **Seamless interoperability with Windows NT for enterprise networking**
  - **Concurrent access to multiple servers including Novell Netware**
  - **Low conventional memory requirement: 4K**
  - **Mobile features: Built-in fax capabilities to send/receive files and messages that can be edited and remote access services**
  - **32-bit networking architecture ensures greater reliability**
  - **Workgroup applications included: Microsoft Mail and Schedule+**
  - **Availability of workgroup add-on for MS-DOS to allow 8088/286 PCs to share resources and function as servers**

- **Cons**
  - **Simpler, less granular security model**
  - **Limited network management tools but focus on centralized control of peer services**

Key points about Netware Lite:

- **Pros**

- Single client allows users to connect to Netware Lite, Netware 2.x, 3.x or 4.x servers
- Some management of servers/workgroups including user-level security
- Announced support for cross-platform connectivity with OS/2, Macintosh and UNIX operating systems
- Peer-peer network add-on for low end 8088 PCs to share resources

- Cons
  - Novell acknowledged incompatibility with Windows for Workgroups 3.11
  - Lack of support for broad network connectivity
  - Substantial conventional memory requirement
  - Real-mode drivers in Netware Lite impact performance significantly compared to Windows for Workgroups
  - Scalability - no more than 50 users per workgroup and users may not simultaneously access resources in 2 or more different workgroups
  - Installation is more difficult than Windows for Workgroups
  - Limited mobile computing features

Major Features Review

Peer Networking Services

Windows for Workgroups 3.11 leverages the Windows architecture while providing users with powerful, easy to use features. For example, the 32-bit architecture of Windows for Workgroups provides tight integration of networking into the operating system thus improving performance and reliability. This architecture will be the basis for developing network support in future versions of Windows. In addition to the 32-bit architecture, we've improved support for NetWare which allows Windows for Workgroups to operate seamlessly with Netware. Windows for Workgroups also offers broad connectivity support for other networks such as LAN Server, Banyan VINES, DEC PATHWORKS and all other networks supported in Windows 3.1. This broad support for industry-standard protocols and server systems keeps networked PCs open in mixed-vendor enterprise environments that typify many corporate information systems. Finally, Windows for Workgroups provides additional support for networked Windows applications through mechanisms like Network DDE to facilitate file and printer sharing.

Network administrators can control peer sharing of resources by selected workstations, specify password settings for enhanced network security and use the powerful domain security controls in Windows NT. Administrators can set policy for entire groups of machines by a editing a single security-settings file or they may choose to provide individual settings for each machine. This allows administrators greater control over security and file and print sharing across the network.

In comparison, Netware Lite offers users some interesting benefits. The single client makes it easier for customers to access the family of Netware servers. The product's user-level security and network management tools leverage Netware's offerings in these two areas so this comes as no surprise that Netware Lite incorporates similar functionality.

However, a significant cause for concern is Novell's acknowledgement that Netware Lite is incomaptible with Windows for Workgroups 3.11. As mentioned earlier, over the next 12 months approximately 30% of all new PCs will ship with Windows for Workgroups. In addition to the potential incompatibilities, users must contend with the product's lack of support for other vendors' networks. The Netware Lite client is designed for the Netware family of servers. These problems have the potential to increase support costs substantially for network administrators. It appears that network administrators will assume greater responsibility with Netware Lite without a significant payback.

Faster Performance & Improved Reliability

Windows for Workgroups 32-bit architecture ensures greater reliability and significant performance improvements in a protect mode environment. For example, hard disk access can be improved by up to 150% with 32-bit disk and file system drivers that benefit network, standalone and remote PC users. In addition, network access is up to 100% faster because of the new 32-bit NDIS 3.0 network-card drivers in Windows for Workgroups 3.11.

For Netware Lite, the drivers are real-mode drivers and include support for DPMS. While this may free conventional memory for users, there is a cost associated with this implementation. A consequence is slower performance since the drivers are 16-bit rather than 32-bit. A second effect is that vendors today support a more powerful protect mode standard: the Windows VxD model. Thus users face the possibility that these drivers may not work with Windows.

Scalability
Netware Lite uses the same workgroup architecture supported in Netware. This means that up to 50 users can be assigned to a workgroup. This limitation poses problems for administrators as they must now incur additional support costs by maintaining multiple workgroups when their networks increase beyond 50 users. Windows for Workgroups does not limit the number of users in a workgroup thus providing users the flexibility to grow their network as needed without incurring significant incremental support costs.

Installation
Netware Lite is more complicated to set-up and configure as a peer-peer network than Windows for Workgroups. The reason is that Netware Lite lacks a common user interface with NetWare 3.x and Netware 4.x. This requirement creates yet one more support burden for administrators and can affect users' productivity.

In contrast, Windows for Workgroups is an extension of the Windows family so current Windows users can install and use this product almost immediately. For example, the product includes a new toolbar in the Windows File Manager and Print Manager for performing common tasks such as accessing network drives and shared resources.

Mobile Computing
For standalone and mobile users computing from home or other remote locations, Windows for Workgroups offers a complete remote access solution. The Remote Access Services client built into Windows for Workgroups allows users to remotely access resources on Windows NT or Windows NT Advanced Server-based networks. By the end of the year we will offer a point-point server that allows mobile users to dial into another Windows for Workgroups machine and access its hard disk. Finally, Windows for Workgroups includes the Microsoft at Work fax software, the *first* PC-based implementation of the Microsoft at Work technology, which allows users to send and receive fax messages and fax files that can be edited from one Windows for Workgroups-based machine to another.

As of the time of this document, it's unclear how Novell is supporting users that must access their PCs remotely. In addition, from the public information available on Netware Lite, there is no discussion of a product strategy to address mobile computing needs.

Summary

When evaluating operating systems, MS-DOS 6.2 provides some significant advantages over DR-DOS 7: it is compatible with applications and existing hardware, has broad industry support and offers better compression and memory management solutions. With MS-DOS 6.2, we've evolved compression to make it the safest compression available today. In addition, ISVs are committed to develop and support new technology like integrated compression in their products. Several product which include support include: Norton Utilities 7.0, PC Tools by Central Point Software, Netroom by Helix Software, and QEMM by Quarterdeck. Finally, by adopting the MS-DOS standard, users can also leverage the huge MS-DOS

infrastructure through books, videos and thousands of trained personnel thus helping to minimize support costs. Although DR-DOS 7 appears to offer to some interesting features, users face significant tradeoffs when adopting an operating system which hasn't delivered complete compatibility and lacks broad industry support.

For networking users, MS-DOS and Windows are the universal clients for all networking products. Netware Lite, on the other hand, is a Netware client. With millions of Netware users running successfully with both MS-DOS and Windows today, it's unclear why a user finds a compelling reason to switch operating systems. Rather these customers need solutions which offer compelling benefits to their network solutions. With its 32-bit network architecture, extension of the Windows family and broad connectivity support, Windows for Workgroups offers both standalone and network customers Windows compatibility, speed and broad connectivity as well as the opportunity to leverage the Windows infrastructure in a networking environment.

Table A. Operating System Features

The following table summarizes the key features of MS-DOS 6.2, DR-DOS 7 and PC DOS 6.1:

Key Features	MS-DOS 6.2	DR-DOS 7	IBM PC DOS 6.1
Compression			
Integrated compression	Yes	Yes, but different format than MS-DOS 6.2.	Uncertain - not shipping at time of this document.
Checksum verification	DoubleGuard continuous checksumming protects against corrupted data being written to disk	Calculates checksum after data written to disk. Does not protect against corrupted data being written to disk	"
Auto Uncompress	Yes	Yes	"
Handles loss of power during compression	Automatically restarts after power loss	Requires complete decompression after power loss and then recompression	"
Automatic mounting of compressed drives	Yes	Yes	"
Surface scan disk before compression	Yes	Yes - limited functionality and works only on compressed drives	"
Conversion utility	Converts Stacker drives	Converts DoubleSpace drives	"
Windows permanent swap file support	Automatic relocation of swap file to host drive	Automatic relocation of swap file to host drive	"
Windows utility	Yes	Yes	"
Defragmenter	Yes	Yes	"
Memory Management			
Easy to use memory optimizer	Yes	No	Yes, but different format than MS-DOS 6.2.
Protect mode support	Support for protect mode drivers available with Windows	DPMS	No
Optimizes upper memory for Windows users	Yes	No	No
Automatic recovery of up to 200K of upper memory	Yes	No	No
Handles loss of power during optimization	Automatically restarts after power loss	No	No
Improved utility to view upper memory	Yes	No	No

Table A. Operating System Features (continued)

Data Protection	MS-DOS 6.2	DR-DOS 7	IBM PC DOS 6.1
Disk analysis and repair tool	Yes. ScanDisk diagnoses and repairs variety of problems on both DoubleSpace and uncompressed drives.	No	No
Backup for MS-DOS and Windows	Yes	Yes but different format than MS-DOS 6.2.	Yes but different format than MS-DOS 6.2.
Undelete for MS-DOS and Windows	Yes	Yes	Yes but different format than MS-DOS 6.2.
Anti-Virus for MS-DOS and Windows	Yes	Yes but different signature format than MS-DOS 6.2.	Yes but different format than MS-DOS 6.2.
Other Features			
Disk cache protects data and includes support for CD-ROM drives	Yes - Smartdrive protects data by writing it to disk before exiting to C: prompt and caches CD-ROM drives.	No	No
Improved utilities to help troubleshoot PC	Yes - Clean Start and Interactive Start make it easy to troubleshoot PCs	No	No
Support for multiple configurations	Yes - MultiBoot option allows for multiple configs	Yes but different format than MS-DOS 6.2.	No
Multitasking	Support available in Windows to multitask MS-DOS applications	Yes, but feature is incompatible with Windows in enhanced mode.	No

Table B. Networking Features

The following table summarizes the key features of Windows for Workgroups 3.11 and Netware Lite:

Key Features	Windows for Workgroups 3.11	Netware Lite
Support for peer networking	Yes	Yes
32-bit network architecture	Yes - ensures greater reliability and improved performance.	No - Network drivers are real-mode drivers which execute in protect mode via DPMS
32-bit disk access and file system drivers	Yes - improves hard disk access by up to 150%	No
Broad support for other vendors' networks (ie. Banyan Vines, DEC PATHWORKS, etc.)	Yes - allows users to connect to multiple networks at the same time	Single client connects to Netware family of servers only
Scalable	Yes - no limit to number of users in a workgroup nor limitations on sharing resources in multiple workgroups	Limited scalability. Workgroup architecture allows a max of 50 users per workgroup and doesn't allow users to share resources in 2 or more different workgroups
Conventional memory required	Very low: 4K	Substantial
Installation	Extension of Windows family means installation is quick and easy.	More difficult than Windows for Workgroups because of lack of common user interface between Netware Lite, Netware 3.x and 4.x.
Security	Simpler, less granular security model	Includes user-level security model supported in Netware
Network management tools	Focus on centralized control of peer services	Some management of servers/workgroups
Support for 8088/286 PCs	Separate workgroup add-on available to allow MS-DOS-based PCs to share resources and function as network servers	Support available for low end PCs to share resources
Mobile computing support	Yes - includes built-in fax capabilities to send/receive files and messages that can be edited. Also includes services to access PCs remotely.	Unknown at the time this document was published.

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