491123

Product Requirement Definition :
PANTHER

Produced By :
Novell - Digital Research
System Group :
GPOS Product Marketing
Revision : 1.00a
Revision Date :
20 December 1991
Copy Number :
Andy Wightman

C0070388

EXHIBIT
1016

401124

CONFIDENTIAL TREATMENT REQUESTED

Scope and Purpose

401125

This document details the proposed future development of DR DOS, in terms of

1. New and enhanced features and functionality

2. New Product version availability dates

These planned developments are justified in terms of market opportunity and revenue potential.

The proposed new features are described in terms of :

1. Increased user benefits

2. Increased user/OEM appeal

3. Exploitation of Focal Features

4. Maintenance of technical lead over competition

Strategic Objectives

1. To extend the technology leadership over competition.

2. To increase the market share of DR DOS and become the market leader for personal computing operating systems.

3. To expand the product line into supplying complete, integrated operating system solutions for the user, the workgroup and for the enterprise.

Developmental Parameters

The DR DOS Product Development Program seeks to exploit the skill and experience of the GPOS Business Unit / European Development Centre.

The GPOS Business Unit is charged with the implementation of the long term strategic development of DR DOS as well as the short term tactical development of the product.

Consistent with the objectives of the Product Marketing Strategy the product development program should incorporate reference to externally sourced functionality.

The product development program should make use of and gain from liaison with Novell development capabilities.

C0070390

Core Business Strategy

1. Product feature development will focus in key market areas.

2. Strategic relationships will be exploited to target specific developments in specific market segments.

3. Product Development should maintain allegiance to " open systems " and standards wherever possible.

4. Product Development should maintain and advance a technical lead over competition while delivering solutions to our customers.

Product Marketing Strategy

1. To develop a consistent and publishable product strategy.

2. To become the client operating system of choice for all networking environments. Panther should represent a network centric operating system as opposed to a DOS/stand alone centric operating system.

3. To continue to offer an alternative general purpose DOS , which is feature packaged and offers real benefits to all users.

4. To become the operating system of choice in all text based operating system environments.

5. To compliment and be compatible with graphically based operating systems

6. To diversify the DR DOS product into a portfolio of personal computing operating systems to better meet the needs of the individual market segments.

7. To develop and maintain a proactive product marketing campaign to realise the business opportunities presented by DR DOS 6.0 and to build a business platform for the launch of Panther.

Market Focus

Product Engineering development and Business Development should focus on satisfying the needs of the following :

1. The medium sized network

2. The Small Workgroup and the LAN or Departmental Workgroup

3. The stand alone user

DR DOS Sales History

Sales to Date

Total sales of DR DOS to date (October 1991) have generated in excess of $ 50 million, this is based on sales of 5 million licences world-wide.

UNITS SOLD	DR DOS 3.3	DR DOS 5.0	DR DOS 6.0
Retail Sales	0	126,000	159,000
OEM Sales	1839,000	2,009,000	454,000
Total	1,829,000	2,135,000	613,000

Sales per version number of DR DOS reflect the significant impact that DR DOS 5.0 had on the products overall performance but even this is being overtaken by the sales success of DR DOS 6.0.

401125

World-wide Distribution Channels

Total Sales of DR DOS by sales region now (October 1991) reflects a more equitable split of business between the regions then say 12 months ago when business from Europe accounted for in excess of 50% of all DR DOS sales.

Cumulative DR DOS Units

Legend: Americas, Europe, Pac, Japan

Total 4.587k
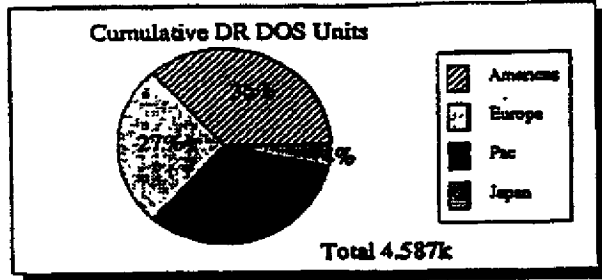
Over the same period of growth of sales revenue through the retail channel has been spectacular, particularly in the US.
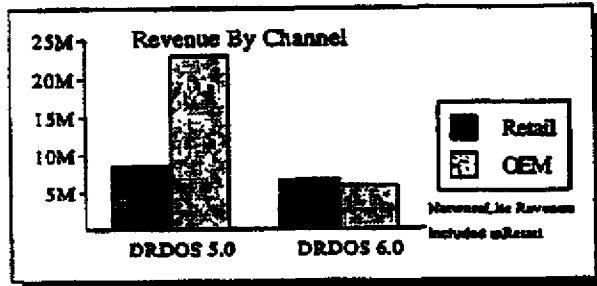
Revenue By Channel

Legend: Retail, OEM

DRDOS 5.0   DRDOS 6.0

MS-CCP-MDL 5010726

MS-CCPMDL 000005010726

Market Segmentation

A simplistic segmentation of the DOS market can be described as follows :

401120

The Portable Segment can be further segmented into the Lite and the Palmtop markets. For the purposes of this Product Requirement Definition we will concentrate on the Lite section which includes Laptops and Notebooks. The whole area of Palmtops is dealt with in a separate Product Requirement Definition for the Merlin product. It is generally considered that the needs of the Laptop and Notebook user are very similar to those of the desktop pc user, while those of the palmtop user warrant separate segmentation.

The following market analysis seeks to explore and quantify the various segments as well as relating them to the development program for Panther.

Market Trends and Analysis

401130

DOS Shipments

DOS shipments over the next 3 - 4 years are forecasted to continue to grow reaching an annual shipment figure of 24 million in 1993 (Source Dataquest : May 1991).This means that in 1993 the OEM market is worth in total approximately $ 240 million (24 m x $10) From these figures alone it is clear that the DOS market continues to represent a significant revenue opportunity for Novell - DRSG.
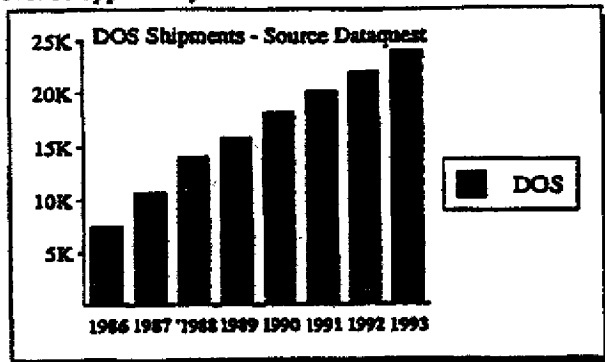
The Installed Base

The most accurate figures (Dataquest May 1991) show a steady increase in the installed base until 1993.

'000's Units	1986	1987	1988	1989	1990	1991	1992	1993
DOS	18,115	28,832	42,841	58,658	76,896	97,022	119,000	143,000

Growth in Networking

401131

World-wide PC networks are currently estimated (source Shearson Lehman 22-10-91) at between 1.8 and 2.0 million. This translates to about 15 - 20 million nodes or approximately 25 % of all PCs world-wide. This penetration is forecasted to increase to about 50 % by 1995. For 1993 it can be estimated that the market penetration of networking will be about 40%, this translates to 57.2 million nodes.
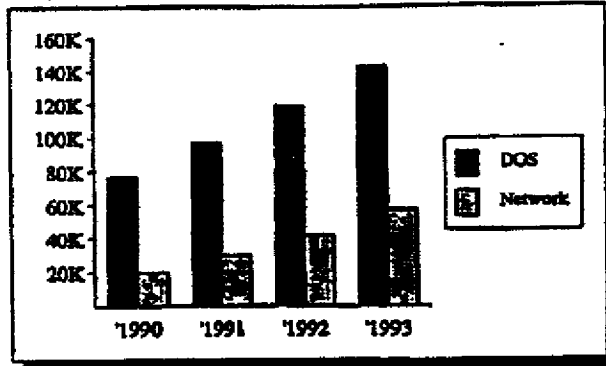
This means that to satisfy the needs of nearly 50 % of the installed base, or 20 million new network users over the next couple of years, DOS must be complimentary to the networking environment.

Similarly, if we assume that the penetration of networking to new PC shipments and installed machines is the same , i.e. 40% (it could be argued that new machines would be more likely to be bought as nodes in 1993 as opposed for use in stand alone mode), then 9.8 million new pc shipments in 1993 will be networked.

This growth represents the most significant trend in the DOS market place. The goal of networking should be to offer features and functionality that deliver a tight integration between the network operating system and the client operating system. These additional features should be in the form of ease of use as well as increased functionality. The more benefits or complimentary features that an advanced DOS can offer either the networked user or the system manager , than the more successful that DOS will be.
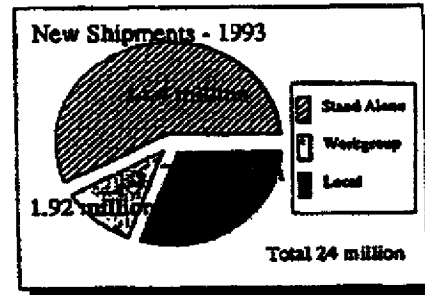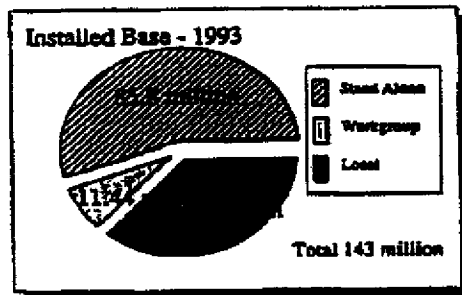
The DOS GAP and Utilities

The lack of a comprehensive Disk Operating System for personal computers has lead to the emergence of the so called DOS Gap.

While DOS, in the form of MS-DOS, has evolved over the years, the addition of >32 MB partitions and code page support, it has failed to keep pace with the changing needs of the market, both software and hardware.

Even those changes in MS-DOS 4.x that did take place brought with them their own burden, i.e. smaller application memory as a consequence of the growth in size of DOS itself. MS-DOS 5.0 attempted to correct the memory issues (as a catch up to DR DOS 5.0) but left other critical areas of importance unaddressed.

Users reaction has been to look elsewhere for a solution to their problems and found it in the software utilities aftermarket.
This market is estimated at approximately $ 500 million per annum with a 50 % year on year growth rate. Most recent figures for the UK suggest that 14 % of all software packages sold in 1991 fell into the software utilities category. High on the list of software utilities are taskswitchers, memory managers, multi taskers and shells.

The acknowledgement of this market need prompted the development of utilities to be incorporated into DR DOS 5.0 and later DR DOS 6.0. MS-DOS 5.0 was truly a catch up adding little of real value in this area except for their task switcher and undelete.

The advantages of having a complete suite of disk utilities within the operating system itself are well recognised by the users : cost of the package, training costs , and incompatibility issues are all arguments against add on utilities.

As the market matures, and corporate computer managers look for complete solutions the need to offer an integrated suite of advanced, yet easy to use disk and system utilities will continue to be of special importance. This is even more critical for a Computer Manager looking to protect his investment (time and money) in DOS applications as well as making maximum usage of hardware (stand alone and networked or to be networked).

The Growth of Windows and Windows NT

The growth of Windows has been well documented. In 1991 sales of over 4 1/2 million units can be verified. However, by 1993, even assuming a continuation of the rapid rate of Windows market penetration, approximately 84% of the installed base will still be running DOS only applications (Source : Dataquest February 1991, Shearson Lehman August 1991)

'000 units	1989	1990	1991	1992	1993
DOS		58,658	76,896	97,022	119,000	143,000
Windows		840	2,500	7,000	13,500	21,000

Windows and Windows NT offer the Computer Manager the level of integration required for applications. System management becomes more irrelevant as memory management is provided seamlessly. However, major gaps still exist, such as disk optimisers, which third parties can be expected to fill. For many Computer Managers Windows and Windows NT will continue to be a future option, made currently unavailable by the hardware requirements. Secondly, it is apparent that many possible users see no real benefit to upgrade their system to Windows.

For 1992 Windows 3.0 shipments are forecasted at 6.5 million units and can be extrapolated to 1993 to 8 million units. This means that given the split of business between channels (62 Retail and 38% OEM - Source Shearson Lehman), nearly 13% of new shipments in 1993 will come with Windows pre loaded. We can estimated that say 80% of retail shipments of Windows will be directed to new machines. This means that of the 24 million new shipments in 1993 nearly 7 million will be primarily Windows machines. Conversely, 17 million will be solely text based.

Installed Base 1993- Windows

Windows
Text Only

Total 143 million

New Shipments 1993

Windows
Text

Total 24 million

MS-CCP-MDL 5010731

MS-CCPMDL 000005010731
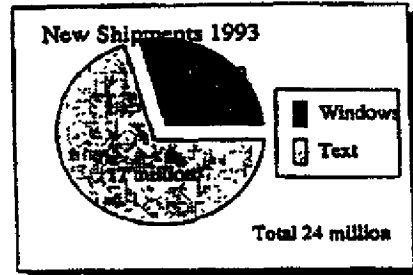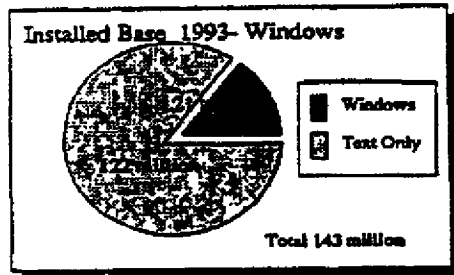
<u>MS DOS 5.0</u>

401134

Nearly 5 million MS DOS 5 upgrades are forecasted to ship in 1992 (Source Shearson Lehman and others).

For 1993 an additional 7 million MS DOS 5 upgrades can be forecasted.

Microsoft are forecasting 17.9 million OEM licences in 1992 (Source Shearson Lehman).

Latest speculation in the press suggest that MS DOS 5.1 will attempt to redress the technological advantage of DR DOS 6.0 by bundling Stacker compression software.

<u>Microsoft - Competitor Analysis</u>

The financial analysis of Microsofts core business revenues is as follows (source Shearson Lehman) :
Source : Shearson Lehman - August 5, 1991

Shearson Lehman forecast that the " contain Microsoft " - PC industry alliances could severely impact on Microsofts business plans. IBMs software deals with Novell (networking), Lotus (distributed applications) Borland (programming languages) and other ISVs could seriously contain Microsofts future growth prospects in several key technologies. Microsofts Quarterly Net Income in $ Millions is as follows and shows the direct impact of the launch of MS-DOS 5.0 and Windows 3.0.
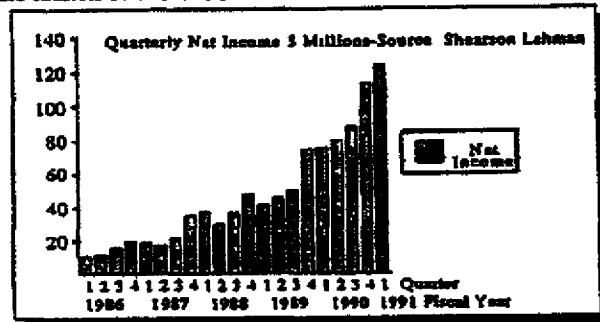
International revenue retail channel growth was 81% for fiscal 1990/91 to $ 897 million or 40% of total sales revenues, while application growth was 66% for fiscal 1990/91 to $ 935 million or 51 % of total revenues.

MS-DOS 5.0 upgrades are forecasted at $ 248 million in 1992 on 5 million unit shipments, less than 10% of the installed pc base.

401135

$Millions	FY90 (A)	FY91 (E)	FY92 (E)
Operating SystemFees	$ 377	$337.4	$396
MS DOS Upgrade		$45	$247.5
Windows	$20	$234.6	$328.0
Applications	$562.7	$935.6	$1200.0
Languages	$57.5	$52.0	$53
Total	$1183	$1843.5	$2485.0

Microsoft have disclosed that 4.7 million units of Windows were shipped in fiscal 1991, this laid the basis for an estimated 52% of all revenue being attributable to Windows 3.0 and-related products.

C0070400

MS-CCP-MDL 5010733

MS-CCPMDL 000005010733

401136

$Millions	FY90 (A)	FY91 (B)	FY92 (B)
Operating SystemFees	$ 377	$337.4	$396
MS DOS Upgrade		$45	$247.5
Windows	$20	$234.6	$328.0
Applications	$562.7	$935.6	$1200.0
Languages	$57.5	$52.0	$53
Total	$1183	$1843.5	$2485.0

Microsoft have disclosed that 4.7 million units of Windows were shipped in fiscal 1991, this laid the basis for an estimated 52% of all revenue being attributable to Windows 3.0 and - related products.

C0070401

401137

Processor Trends

Over the last 12 months there has been a significant new trends have emerged in processor shipments.

The 386sx is generally considered to be the entry level processor, with shipments of the 80286 falling quickly.

Shipments - Millions	1991	1992	1993
8088/86	3.18	3	3
80286	5.47	4	2
80386 and above	13.34	15	17

Processor Shipments - 1993

Installed Base - Millions	1991	1992	1993
8088/96	38	40	41
80286	32	35	37
80386 and above	27.6	43	60

Processor Installed Base - 1993
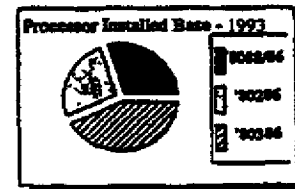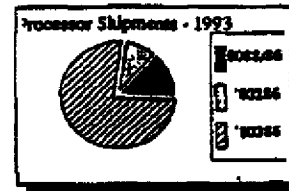
This means that in 1993 41% of all machines will be capable of multitasking - source for above figures Dataquest May 1991. Note : Dataquest do not correlate their hardware and processor shipment figures and as such there

Installed Base 1993 - Segmentation

Windows/ Networked
Windows/ Stand Alone
Networked/ DOS Only
StandAlone/ DOS Only

Total 43 million
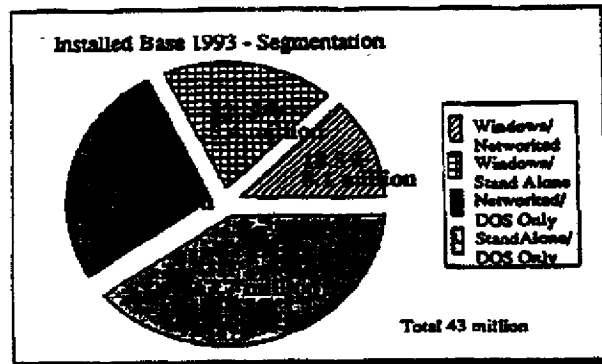
is a slight differential between the two sets of forecasts

It can be assumed that the 3 million shipments of 8088/86 processors will probably be into palmtop machines, and that the majority of the 286 processors will be into low end laptops.

C0070402

MS-CCP-MDL 5010735

MS-CCPMDL 000005010735

Rationale For Panther

Several points are clear from the preceding market analysis.

Firstly that the market is maturing, in terms of the increased market penetration of both networking and graphical environments as well as the trend towards 80386 processors

Secondly that the major trend in the next couple of years is the significant increase in networked pc's.

Thirdly, it is suggested that non 386 machines are either destined for the palmtop or the very low end of the desktop and are not considered a target market for Panther, but could and should be considered for Merlin. At the same time the installed base of '386 or below will be over two years old. This represents a market which has either already upgraded to MS DOS 5.0 or DR DOS or has decided not to, this means that their potential to upgarde to Panther must be considered low.

As such the '386 and above pcs represent the target market for Panther.

Finally while it is maturing there are still very large numbers of users for whom a text based operating system is the desired choice, this is irrespective of the ability of their system to cope with the demands of Windows 3.x.

As such 4 market segments can be quantified for both the installed base and new shipments.

1. Stand Alone without Windows

2. Networked without Windows

3. Standalone with Windows

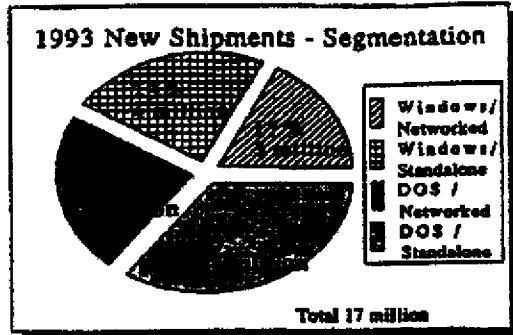4. Networked with Windows

New Shipments Marker Segmentation

24 million total of which 17 million are 386 or above.

Of this 17 million, 7 million are destined to be Windows 3.x based, which means 10 million will be DOS only.

Of this 17 million, 6.8 million (40%) will be networked.

This means that 4 million DOS only and 3 million Windows 3.x based machines will be networked.

1993 New Shipments - Segmentation

Legend:
- Windows / Networked
- Windows / Standalone
- DOS / Networked
- DOS / Standalone

Total 17 million

By concentrating on functionality that enhances the networking environment Panther can offer significant benefits to 83 % of the new shipments(networked DOS only and Networked Windows) in 1993.

By offering advanced functionality such as multitasking Panther would appeal directly to 35% (DOS only / stand alone) of the market.

Installed Base - Market Segmentation

For the installed base, of 119 million, 43 million are 386 or above machines, of these 28 million will have been supplied with DR DOS 5.0, 6.0 or MS DOS 5.x.

The remainder, 15 million will be machines which are over two years old and which some have already been upgraded by retail distribution to DR DOS 5.0, 6.0 or MS DOS 5.x

This means that the greatest percentage of the installed base will be upgrading from an advanced DOS. As such to be sufficiently attractive to these users who are already possibly enjoying the benefits of memory management and additional disk performance, Panther must add real value.

13.5 million will be Windows 3.x based machines and 17 million will be networked. This means that 29.5 million will be DOS only machines of which 11.8 million will be networked.

Again it can be considered that the networked DOS or Windows or stand alone DOS represent the best potential for Panther, assuming that Panther can deliver real added value in terms of network integration of multitasking for non Windows 386 machines.

On the basis of the above Panther must add real benefits to the network use to capture and own this segment. Panther should be network centric as opposed to DOS / stand alone centric.

Panther must continue to add real value and benefits to be the operating system of choice for text based pc' s .

C0070404

MS-CCP-MDL 5010737

Finally Panther must be complimentary to Windows 3.x but add special value where a   401140
Windows 3.x based machine is also networked.
In summary therefore Panther should :

1. Offer improved network integration to the networked DOS only and Windows 3.x
segments

2. Offer improved network integration, compatibility and performance to the
Networked/Windows segment.

3. Offer exploitation of processor power to the DOS only segment, concentrating on the 386
and above processor based machines.

<u>Sales Forecasts / Targets for Panther</u>

DR DOS 5.0 has achieved OEM sales of 2 million to date, with 100, 000 units being shipped
through the retail channel. Average OEM pricing is calculated at $10 per copy and retail
pricing is $ 30 per copy.

The Product Marketing targets for Panther are as follows :

	DR DOS 5.0	DR DOS 6.0	Panther
OEM	2 million	5 million	8 million
Retail	125, 000	1 million	2 million
Total Units	1.9 million	6 million	10 million
Total Revenue	$ 23.75 million	$ 80 million	$ 140 million

Previously we calculated the OEM market in 1993 as being valued at $ 240 million ($ 10 x
24 million units), the total retail upgrade market can be valued at $ 210 ($ 30 x 7 million
units (6% installed base).

This would mean that Novell - DRSG would gain 31 % market share of the $ 450 million
total forecasted revenue potential

MS-CCP-MDL 5010738

Company Confidential

401141

Product RoadMap

Panther should achieve Engineering Release by mid August 1992, with Manufacturing Release being 1 September 1992.

C0070406

MS-CCP-MDL 5010739

MS-CCPMDL 000005010739

1. Compatibility

Compatibility is critical to the on going acceptance of DR DOS by both OEMs and the corporate Computer Manager. The concept of compatibility becomes extended as DR DOS reaches more users, for these users the level of compatibility that is required includes not only base hardware and software applications, but the ability of DR DOS to run with and benefit from additional hardware and / or software extensions.

1.1 Panther is primarily targeted at the 80386sx and above processors with a minimum of 2Mb of RAM, but will support reduced functionality on the 8088/86 and 80286.

1.2 Panther should run all DOS compatible applications, including Networking and Communications applications, on all PC compatible hardware.
* *To offer full confidence all users in running applications*

1.3 The Panther kernel will be fully compatible to the IBM DOS 5.x kernel, with compatibility to all IBM DOS 5.x software.
* *To ensure ongoing compatibility to emerging DOS 5.x software.*

1.4 All IBM DOS 5.x utilities and commands[1] will be included in Panther, and optionally use the same command or function call to invoke the command or utility.
* *Offer full compatibility to all users and to maintain allegiance to market standards*

The following are the additional IBM DOS 5.x commands and utilities that will be supported by Panther :
Config Processing :
Add support for Secondary Cache Buffers - BUFFERS = n.m   * Add support to load buffers into HIMEM automatically
* Add Alias on HIDEVICE and DEVICEHIGH work automatically   * Add support for minimum for device loading
* Add support for DOS=HIGH or LOW and UMB and NOUMB   Add support for /I on DRIVPARM to indicate disk is 3 1/2"
Command Processing :
ASSIGN - Add /STATUS switch   * BACKUP - Allow setting of return error codes
COMMAND - Add /MSG messages in memory
COMP - Add /D mismatches in decimal
        - Add /L display line numbers in offset   - Add /N number comparing first number of lines
        - Add /C non case sensitive operation   COPY - Add /V verify
DEL/ERASE - Add /P switch
* DIR - Add /A: attributes switch
        - Add   /O: sort order switch   - Add /S subdirectory switch
        - Add /B headless switch   - Add /L lowercase switch
DISKCOMP - Allow setting of return error codes   DISKCOPY - Add /V verify
* DOSKEY - Add macroname support   - Add /REINSTALL
        - Add /BUFSIZ   - Add /Macros
        - Add /History   - Add /Insert
ED/EDIT - Add separate ED/EDIT to run from command line to give ON OFF AUTO support and WRITEK expression ON and OFF support
FASTOPEN - Add command line support and /X
FC - Add /nnn number of matching lines to resync
        - Add /Lnn internal buffer   - Add /A display lines as ASCII
        - Add /T do not expand tabs to space   FIND - Add /I case sensitive search
* FORMAT - Allow setting of return error codes   GRAFTABL - Add 852, 857, 861, 869 and arrays/errorlevel returns
* KEYB - Add /ID=yyy
        - Add Iceland, Greek, Czech, Slovak, Yugoslavia and Poland   - Add /E - force 101/102 key support
* LOADHIGH - Alias for HILOAD
* MEM - Add /CLASSIFY
        - Add /DEBUG   - Add /PROGRAM
SETUP - Improve Human Factors areas e.g. Red text on black background
* SYS - Add support for second drive   * TIME - Add AM and PM feature for setting
TREE - Add /A to show graphics chars as text.
UNDELETE - Add alias /A: for /ALL
        - Add alias /L for /LIST   - Add alias /D for /R
        - Add /DOS   - Add /DT alias for /R
UNFORMAT - Add /L, /U, /A, /Test, /P, /PARTN
* = PRIORITY ITEMS

401145

1.5 All utilities and commands included in Panther should offer the same switches and command options as are already available with IBM DOS 5.x
* *To provide full compatibility to all users and to maintain allegiance to market standards*

1.6 Panther should support all printers supported by the current release of IBM DOS 5.x.
* *To provide full compatibility to all users and to maintain allegiance to market standards*

1.7 Panther should support all IBM PS/2 hardware extensions[2].
* *To offer users full compatibility and support for market standard*

1.8 Support for Windows 3.x in all modes.

1.9 The Panther File System will support a mode to enable a user to take advantage of Windows 3.x FastDISK

---

[1] Panther will support the following IBM PS/2 Hardware extensions : To be determined

MS-CCP-MDL 5010741

MS-CCPMDL 000005010741

2. Enhanced Memory Management

The success of DR DOS 5.0 was founded on its integrated memory management capabilities, MemoryMAX. These capabilities were extended with DR DOS 6.0.

Despite the improved application memory made available via MemoryMAX, the 640k limitation of DOS remains nevertheless a very real issue especially as applications become more memory hungry and systems become more complex with several drivers being loaded (Network, E-Mail, Fax, Mouse, Mainframe Connectivity, Bridges) . In these situations gains of only a few Kb of memory represent the difference between the system working or not.

DR DOS 5.0 provided a real technical lead over MS-DOS in terms of memory management. This lead was eroded by MS-DOS 5 and only set back in balance with the release of DR DOS 6.0.

Panther should look to re establish the substantial technical lead over MS-DOS in terms of memory management. To this end Panther should look to support 16/32 bit applications via DOS extender technology, as well as further maximising the 640Kb area DOS applications

2.1 Panther will execute as far as possible in extended memory to minimise the amount of conventional, upper and HMA memory currently used, this should include the Kernel, BIOS, multitasker and 386 Memory Manager.
* *This will maximise the amount of memory available for applications.*

2.2 Panther will include a Memory Configuration Optimiser to be run as part of the SETUP/INSTALL program. This will automatically check memory available, type of memory, (LIM, extended, upper, HMA and conventional, and processor type). It will check for the presence and size of drivers and TSRs in the current CONFIG.SYS and AUTOEXEC.BAT files.
Specifically the Panther Memory Optimiser should -
- Parse Config.Sys and Autoexec.Bat
- Locate all TSRs and Device Drivers
- Calculate exact size TSRs and Drivers require in Upper Memory
- Work out optimal loading sequence
- Use LIM Frame Techniques to provide extra memory at unit time
* *This will ensure that memory management is even easier and less traumatic even for the novice.*

2.3 Support " Stealth " type mapping out of system ROM space

2.4 Allow Preview of memory configuration.
* *This will ensure that setup is even easier.*

2.5 Panther should will also check for the presence of the top 100 popular applications to determine the optimum overall configuration as well as the mapping of each into available memory.
* *This will ensure that memory management is even easier.*

C0070409

MS-CCP-MDL 5010742

MS-CCPMDL 000005010742

401143

2.4 Panther will build on the memory management capabilities of DR DOS 6.0 by offering support for 16 and 32 bit protected mode application on Intel 386, 486 and compatible microprocessors.

 * *This will enable Panther to run applications which can access up to 4Gb on 386 and 486 based machines*
 *

2.5 Panther will include a DPMI server (DOS Protected Mode Interface) - appropriate Release or Version number.

 * *DPMI will allow Panther to support DOS Extender applications without compromising the operating system kernel. DPMI is rapidly becoming a defacto industry standard and tick box item. It would also allow Panther to provide the basis for a non dedicated NetWare 3.x server. Third parties should then be encouraged to write to any extensions to DPMI that are developed to support the above.*

2.6 Where Intel compatible 286 microprocessors, such as those available from Chips and Technology, AMD[1] etc, include extended functionality which allows for users to access the upper memory area, Panther will automatically detect the presence of these processors and allocate memory accordingly.

 * *This will improve application memory on specified hardware.*

2.7 Panther should also have a smaller DOS kernel.

 * *Increase the memory available to applications, drivers in HMA.*

2.8 Panther should support the loading of protected mode device drivers and TSRs into extended memory.

 * *This will allow for three major system extensions, to run in extended memory, thus freeing up conventional memory :*
     - *Super PCKwik*
     - *SuperStor*
     - *Netware and Netware Lite Redirector and IPX*

2.9 Panther will offer full compatibility, with no loss of functionality, to Windows 3.x, QEMM 6.0, and 386 MAX 6.0 memory management. Specifically Panther will support Upper Memory in the same way as other memory managers, plus support for loading in Upper and High Memory all Panther utilities, TSRs, and device drivers.

 * *Maximise memory available to DOS applications running under Windows 3.x and third party memory managers*

2.10 The MEM utility will be improved to give a display of the amounts and types of memory listed in order of owner.

 * *Parity to MS-DOS 5.0*

---

[1] DR DOS already supports the use of upper memory on the following Intel compatible 286 microprocessors :

Chips and Technology - NeAT, NeATsx, LeAPSet, LeAPSetsx, SCAT
Advanced Micro Devices - AMD 286 LX

C0070410

401140

3. Multitasking

With the advent of Windows the market and individual users now expect multitasking to be an essential part of future operating systems. A multitasker within Panther will demonstrate Digital Research's ability and commitment to deliver functionality according to market expectations and trends.

It is firmly believed that the real benefits of multitasking will be where background communications, local area networking, or mainframe connectivity, and such as auditing, backup and virus scanning is a requirement.

3.1 Panther will offer true multitasking as an option using the protected mode of the Intel 386sx and above and compatible microprocessors.

- *Within a multitasking evironment system and user productivity can be improved by allowing time consuming tasks that require little interaction to be performed in the background, such as backup, scanning for viruses, auditing etc.*

3.2 Panther will be able to multitask graphic applications.

3.3 Panther will be able to multitask DOS text application in moveable, sizeable and overlapping windows. in 25 line and 80 column mode, in VGA and above resolution

3.4 Panther multitasking will be fully pre-emptive as opposed to co-operative[4]. Processor time and system resources will be fully managed by the Panther Kernel and allocated in the most efficient manner practicable.

- *This approach will maximise the efficiency of the system both in terms of performance and effective use of resources.*

3.5 Panther will provide a DPMI server[5]. DPMI applications written to be network aware will be capable or running alongside other similarly designed applications. Panther will be capable of running DPMI and non-DPMI applications alongside each other.

- *Users will have as wide a choice as possible of applications to multitask on Panther including DOS extender applications.*

3.6 Applications will be configurable to load automatically as tasks under the Panther multi tasking environment and assigned memory and peripheral resources without need for configuration.

- *Users will be able to make use of their preferred applications as quickly as possible after system startup.*

---

[4] Co operative multi tasking is where more than one application shared control of the processor and the processor pools. These tasks " co operate " amongst themselves with regard to the allocation of processor power.

Pre emptive multi tasking is defined as where the operating system, has full control of the system and strictly shares processor power and system resources between processes. In a fully pre emptive system, applications run at a lower privilege level than the operating system.

[5] DOS Protected Mode Interface is a programming interface that allows protected mode DOS applications (i.e. those with DOS extenders, which allow an application to run in protected mode memory while maximising compatibility with DOS) to co operate within a multi tasking environment and allows non privilege level applications (those that cannot switch between real and protected mode) to gain access to system resources.

C0070411

MS-CCP-MDL 5010744

4011.17

3.7 An API (Application Program Interface) for the Panther multitasking environment will be made available to software vendors[6], which is compatible to industry standards

* *This will give developers the means to develop special purpose applications to take advantage special operating system features such as inter-process communication.*

3.8 The Panther multitasker will be modular allowing users to optionally select it as part of their installation, dependant on their hardware/processor characteristics. The installation procedure will prompt the user, having identified the processor type, to choose whether to invoke the Panther multitasker.

* *Allow the user to exercise full choice over the configuration of the system.*

3.9 DOS Extenders will enjoy a " fastpath" to the DR DOS operating system resident in protected mode[7].

* *This will improve the performance of DOS extended applications running in the . Panther protected mode operating system.*

3.10 Panther will support and where appropriate supply utilities that can run as a background task (even when Windows 3.x is running). Examples of Background Tasks :

 Disk Defragmentation
 Background Disk Compression
 Panther Print Spooler
 Facilitation of Network wide auditing by logging which applications have been invoked and provide feedback to network
 Backup to tape, floppy or server in the background
 Provide a remote console for a system manger to access files and data on the client pc
 Provide a Console-less remote agent that can be commanded by a remote process or the system supervisor to run any background task
 Monitoring of applications being loaded and prevention of applications being loaded if simultaneous use exceed license or wrong classification of time and day or login privilege

* *Add real value to Panther multitasking*

3.11 The Panther multitasker will be controllable from the command line, from within the shell or via a pop up, mouse aware menu.

* *Ease of use and consistency between the Panther multitasker and the DR DOS 6.0 taskswitcher.*

3.12 The Panther multitasker will offer the user a " cut and paste " functionality, with short cut keys.

* *Real added value and consistency with the DR DOS 6.0 taskswitcher.*

3.13 The Panther multitasker will support the DR DOS " undelete " functionality, even when more than one task is active.

* *Ensuring that the user gains real benefits from all Panther functionality. Consistency with DR DOS 6.0*

---

[6] The Panther Multi tasking API extensions will be a superset of the MSDOS/TaskMax APL.

[7] A DOS Extender is a body of software that provides an interface between DOS and an application that runs in protected mode. It provides the application with access to DOS in real mode while running the actual application in protected mode. If Panther itself is a protected mode operating system, then the DOS Extender will interface directly to Panther in protected mode and not via real mode.

401145

3.14 Panther multitasking will allow users to run Windows 3.x in standard mode.

3.15 Panther will allow advanced users to specify the ration of CPU time to be allocated to foreground and background tasks
*   *This will allow users to provide the maximum performance to foreground tasks while allowing background tasks to function.*

3.16 Panther will support the option to run a single VCPI compliant application.

C0070413

MS-CCP-MDL 5010746

MS-CCPMDL 000005010746

4. User Interface

4. User Interface

We regard as axiomatic that Panther will offer a graphical shell to assist novice and experienced users. The shell must present a view of the state of the computer and offer implicit and explicit commands to control it. It must use the full capabilities of graphics to improve understanding, increase the amount of information displayed, and reduce the complexity of common commands.
The existing ViewMAX shell is probably the best starting point, at least for describing what additional functionality and other improvements are desired, so the requirements that follow are to be taken as relative to ViewMAX 2.0.

4.1 DOS 5.x considerations
The shell must include similar functionality to DOS 5.x's shell. This includes:
-select across directories extended mode for non-consecutive select status lineprint support select all / deselect allcopy program listsmove filechange attributes (archive, hidden, system)

4.2 OS/2 considerations
In the visual design, keyboard and mouse usage, terminology and functionality the shell will, as far as practicable, conform to IBM's current practice and declared intentions. This implies the use of IBM's CUA specification, the redesign of 3-D features to mimic OS/2 2.0's Presentation Manager, and the adoption of some parts of the OS/2 PM Workplace Shell. Note, though, that IBM proposes to migrate PM towards having the same appearance as OSF's Motif (which was in turn designed to be similar to PM), so our design goal will be Motif-conformance, not PM-conformance.

4.3 Functionality and Design
4.3.1 Functionality enhancements
In addition to existing ViewMAX functionality, the shell must offer:

4.3.1.1 Windows.

Windows will be movable, sizable, overlapping windows à la GEM Desktop 1.x. Although the current configuration of two half-screen windows may be retained as the default, further windows may be opened on demand. Some limit on the number of open windows is acceptable. The Copy command becomes ambiguous with more than two windows, so will be disabled.

Ideally, window sizing would be effected by dragging the border as in Windows, PM, etc. As ViewMAX currently does not draw borders, it would be acceptable to use a size-box in the lower right corner of the window.

GEM is now unusual in treating a mouse click on an untopped window as merely a request to top the window. The shell will work like Windows and GEM Desktop and not require a second click to select an object in an untopped window.

MicroSoft Windows and PM use icons drawn in a parent window to represent an open window without using much screen space. We should investigate the feasibility of doing

something similar, or of having some other mechanism to cope with screen clutter, which becomes a problem with many open windows.

4.3.1.2 User-definable Menus or Program Groups

As a short-cut the user will be able to create, modify and use some mechanism for launching their most-used commands without having to remember where the .EXE (or .BAT) file is, what it is called and what its command-tail parameters are.

Two means of achieving this have been discussed. These are user definable menus and program groups. In the context of a DOS shell, and given the popularity of Norton's Desktop for Windows, the support of Program Groups seems more sensible. Once you have program groups, the desire for user-definable menus probably goes away. However, we wish to support an upgrade path for customers who have used the macro and menu features of DOS 5. This support may consist of converting their .INI files to the equivalent program group(s).

Program groups should appear as windows, but must be visually distinguished from file windows. A default program group, initially containing DR DOS utilities, could be allowed to display its wares on the background window.

4.3.1.3 Drag and Drop
The drag-and-drop metaphor will be extended. Dropping a file or other icon on a program icon should invoke the program with the dropped item in its command tail. This can then be used as a general mechanism for deleting, printing, etc.

4.3.1.4 TaskMAX integration
As in Windows 3.x, the user will be able to interface with TaskMAX via the shell.

4.3.1.5 Netware integration
Hooks to support tools similar to Novell's currently Windows-based LAN Workplace for DOS will be in place, if necessary. Other structural changes needed to achieve 'seamless' network integration must be identified.

4.3.1.6 DOSBOOK.
It would be highly desirable to give access to DOSBOOK's on-line documentation while in ViewMAX. Ideally, it would be as integrated as is Windows 3.0's Help system.

4.3.1.7 FileLink.
Customers are requesting access to FileLink setup parameters from the shell, and integration of remote disk drives into the view. The feasibility and benefits of this need to be established.

4.3.1.8 Screensaver
A screensaver will be incorporated. A minimal screensaver is acceptable, but hooks for 'fun' savers would be desirable.

4.3.2 Cosmetic enhancements
4.3.2.1 Background image.

As per Windows 3.x, the user must be able to select from a library of background images with which the screen will be painted. Images will be in an industry-standard format so that users can (potentially) create their own.

4.3.2.2 Colored icons.

Icons must have multiple planes so that they appear in polychrome on colour screens, but correctly on monochrome screens. More icons are needed for different drive types, applications and utilities. It would be desirable if icons in .EXE files could be displayed à la Windows.

4.3.2.3 Proportional fonts.

It is generally agreed that proportional fonts are much more attractive. We should replace the large and small system fonts by proportional ones in all screen drivers. Centering, right alignment and justification of text must take account of this. The conversion of resource file coordinates to screen position should be done on the basis of a notional character cell width. File viewers may need to be aware of the variable character widths. Window border features (Close box, scroll arrows, etc.) are implemented as control characters in the system font. There need be no change to these.

4.3.2.4 3-D effects.

ViewMAX 2.0 introduced some 3-D effects, but they do not look the same as PM or Motif. Generally, PM uses singlepixel width highlights and shadows whereas Motif uses two-pixels. We should adopt one or the other (to be decided). Note that these schemes do allow coloured button-tops, unlike Windows.

4.4 File Browser / Viewer

The shell should incorporate a high performance file finder and viewer, able to search and display the contents of local and remote files.

4.5 Windows 3.x Program Manager / OS/2 Workplace Shell

The installation of DR DOS should add its utilities into one or more program groups in Windows 3.x if Windows is already installed. Similarly for OS/2 2.0's Workplace Shell.

<u>5. Disk Filing System</u>   401132

*While the PC industry has developed and matured over the last 10 years, DOS has effectively
changed very little. This inertia is most readily noticeable in the area of disk filing system.
DOS, is a Disk Operating System, and at its heart is the need to perform disk based
operations effectively and efficiently. To a certain extent the need to maintain backward
compatibility has lead to there being very few changes in the area of disk management*

5.1 The Panther disk sub system will be extended to allow for the duplication of a file in a
compressed format.
* *This will allow for speedier backup, xcopy and FileLINK Transfer.*

5.2 Consideration should be given to the ability of moving compressed data in a compressed
form across a network.

5.3 Panther will offer seamless support for the compression of data to floppy diskettes. This
means that the floppy drive will retain its original drive letter when accessing compressed or
uncompressed data. Data compressed on a floppy will be readable on systems running non
Panther DOS. When a compressed floppy is read onto a system without Panther, then a
banner will appear detailing the benefits of Panther. Diskcopy, Format, Sys and Chkdsk will
be updated to support compressed floppies.
* *Compression of data on floppy disks or tape drives complimenting the compression of
data on hard disks is highly desirable for many users.*
5.4 All API extensions to access/control compressed drives will be fully documented and
available to third party developers to support.

5.5 The Panther Data Compression function will be enhanced to offer the user a preview of
the compressed drive.
* *For those users who are uncertain of the benefits that could be attained by compressing
data on the disk, a disk compression preview will be provided. This will also have the
additional benefit of identifying how much of the disk needs to be compressed and how
much can or will be left uncompressed for permanent swap files etc.*

5.6 The Panther Data Compression function will be enhanced to offer Alternative Data
Compression ratios dynamically calculated during conversion and made simple for the user.
* *This would give the user the ability to select the appropriate compression ratio to enjoy
maximum benefit from data compression*

5.7 The Panther Data Compression function will be enhanced to offer a Superstor Driver in
protected mode for use on 286 and 386 and above machines.
* *This would allow for a smaller conventional and upper memory footprint and offer the
user greater conventional memory.*

5.8 The Panther Disk Cache, based on PCKwik from Multisoft will be enhanced to run as a
protected mode driver for use on 286 and 386 and above machines
* *This would allow for a smaller conventional and upper memory footprint and offer the
user greater conventional memory*

C0070417

491133

5.9 Panther will offer a full screen Preview of Disk Defragmentation showing a calculation of the fragmentation of a disk in terms of percentage as well as the approximate time to defragment.
* *This will allow users the benefits of seeing in advance how disk defragmentation could improve their disk access.*

5.10 The Panther Disk Defragmentation function will analyse the disk at boot up (or a selected date and time) and if the disk is fragmented to a pre determined amount then defragmentation will be invoked.
* *This will make disk defragmentation effectively transparent to the user*

5.11 Panther will support the storage file information including Icon, country information etc in extended .exe headers

5.12 Panther will provide CD ROM MSCDEX compatible protected mode multi mode driver.

5.13 Panther will support multiple drives.

5.14 Panther will be deliverable on three 1.44Mb diskettes
* *This will ensure that Cost of Goods is not increased significantly.*

5.15 The Panther Disk Defragmentation function will be improved and enhanced over that currently available in DR DOS 6.0 to improve defragmentation speed and efficiency of Superstor partitions.
* *Increased speed and performance.*

5.16 Panther will incorporate a Virus Scanner, which could be updated, by third parties, to registered users.
* *Improved level of comfort to all users especially corporate or networked systems.*

5.17 Support cross type memory lending from new version of PCKWIK
* *Allows more flexible and efficient use of memory*

401154

6. Network Management and Integration

The 1990's will undoubtedly be the decade of the network.

In the DOS world there has been a gradual convergence of technologies between the DOS client operating system and the server operating system. Panther will seek to accelerate this process substantially.

6.1 Panther will be fully compatible to all networking operating systems.

* *Increasingly users will be networking their systems. Panther must at all times be compatible and facilitate the networking.*

6.2 Panther will include as an option within the installation and setup the ability to load the client NetWare 3.x and Netware Lite software (IPX, NetX).

* *As the market moves away from stand alone pc's to networked systems, Panther will offer the user an easy network installation.*

6.3 Panther will be fully downloadable from a network server

6.4 In accessing application software from a network server, Panther will provide functionality to allow the network server to check that the user has legitimate access to that application and that a preset limit on the number of copies has not been exceeded.

* *Panther will start to address many of the emergent issues of network management and system control. Checking to verify the legitimacy of a licences number of software is the first step to solving many of these new issues.*

6.5 Provide functionality to allow Remote Console Handover to allow applications to run and be viewed remotely

* *Ease of use and administration for system manager.*

6.6 Panther will provide support for new extended redirector interface , allowing both real and protected mode interfaces at INT2F or to be defined, for network developers

6.7 Define a local workstation naming convention such that common workstation and server utilities can refer to the local machine as well as remote servers

Command   server/user
              server/disk

to

              local/user
              local/disk

6.8 Define an API and provide Network management agents to instrument/monitor operating system usage. Monitor and update applications, Scan for Viruses, Backup

6.9 Add additional NetWare 3.11 level of security to local system e.g. eXecute privileges

6.10 Panther should support a subset of NetWare Server functionality on the local disk, using aliases where appropriate e.g. Salvage - Undelete[8]
   * *Panther will move towards compatibility to all NetWare Server commands and provide users consistent access to similar functionality.*

6.11 Panther should support the " Login Script " functionality available on NetWare locally on Config.Sys, and batch files.[9]
   * *Providing additional but similar functionality to the NetWare server operating system, the client operating system will allow a network wide functionality increase, rather than be limited to services associated with the server only.*
   * *System managers already familiar with NetWare will be able to provide similar functionality to the Client in effect extending the facilities enterprise wide.*

6.12 Panther utilities should adopt a NetWare " look and fell " where appropriate.

6.13 Panther multitasking will include support for multi-session Novell connectivity using ODI (Open Data Interchange) or ODINSUP level drivers
   * *This will have the benefit of allowing a user to interact with several network applications and maintain several separte logins concurrently.*

---

[8] Server commands for consideration, for local support include : Capture, Chkdir, Chkvol, Colorpal, Endcap, Flag, Flag Dir, Grant, ListDir, Login, Logout, Map, Menu, NDir, NPrint, NVer, PConsole, Setpass, Salvage, SList, Syscon, TList, Volinfo, WhoAmI Add suppot for additional server filesystem attributes locally above the : Archive, Hidden, System , Rendg, already supported include : Copy Inhibit, Delete Inhibit, Purge, Rename Inhibit, Read Audit, Shareable, Transactional, Write Audit, Execute only, via an extended file system.

[9] Example : AM_PM, Day, Day_of_Week, Hour, NDAY-of_Week, Hour24, Minute, Second, Greeting_Time, Month, Month_Name, Year, Short_Year, Full_Name, Login_Name, New_Mail, Station, P_Station, OS, OS_Version, ErrorLevel. Extended "If..Then, including : is, is, is, equals, is not, is, <>, does not equal, Not equal to, is greater, is, is less than, or equal to. Multiple " if ...and... then " , Begin, Endblock statements Plus others to be determined.

401336

7. Security

It is remarkable that DOS, in the form of MS-DOS, is the only significant operating system without in built security. Unix, OS/2 and even DOS networks all offer some form of security.

DR DOS 5.0 and subsequently DR DOS 6.0 capitalised on this omission in MS-DOS.

The current level of security offered by DR DOS 6.0 is adequate in most instances. However, for many strategic end users (large corporate accounts, government offices etc) the level of security currently offered is insufficient.

Panther will focus on offering improved and more resilient user based security

7.1 Panther security will include an option to encrypt a disk.
  * *For those users who require even greater security Panther will offer the ability to encrypt data stored on hard disk or on a floppy.*

7.2 NetWare security will be optionally available for files stored locally.
  * *To allow consistency across a network, Panther will permit the storage of secure data on a disk, floppy or tape drive in a format compatible to NetWare security*

7.3 File password security, will be superseded in Panther by a new user based security, Panther will offer an security upgrade path.

7.4 Panther secure partitions will employ more sophisticated techniques to practically improve their resistance to hackers.
  * *Improved security for hard disks*

7.5 Panther security will compliment all hardware security extensions of IBM PS/2 s

7.6 Panther will not conflict with NetWare security.

7.7 Panther will offer the following enhanced security features :
        Read/Write and EXecute access to floppy drives
        User access to specified Config.sys
        Secure comms and parallel ports

7.8 Panther will support hardware identification through and extended device driver API.

7.9 Each user will be able to maintain their own Config.sys and autoexec.bat.
  * *Users sharing machines will have their own set up*

7.10 security will mainatin an audit trail of all user logins and activity

7.11 Panther security will have the ability to bar users from the system at pre set times.

C0070421

MS-CCP-MDL 5010754

8.Portability

Product development will recognise the significant growth in the lite market and build functionality to support portability. Many of these functions will be high priority items for and undertaken as part of the Merlin project

8.1 Panther will support an OEM auto resume/save functions.
* *Provide similar support as third party memory manager. Specifically '386 memory management should support OEMs implementing this feature.*

8.2 Panther will be fully ROMable
* *Maintain upward compatibility with existing DR DOS based systems.*

8.3 Panther will support the PCMCIA and JEIDA standard for Flash Memory Cards
* *Provide driver device and full screen MEMCARD type utilities*

8.4 Panther will support an advanced BatteryMAX
* *Required to maintain counter advantage Microsoft has with the ROM version of MS DOS 5.0*

8.5 Panther will support the Microsoft/Intel APM (Advanced Power Management) specification
* *Required to provide added value over and above Microsoft offering for NoteBooks.*

8.6 RS232 parallel port network
* *Required to counter competitive advantage Microsoft has with INTERLINK product, which will be shipped with ROM version of MS DOS 5.0*

401155

9. Ease of Use/System Optimisation.

As DR DOS becomes an increasingly powerful and sophisticated operating system, it is critical that Panther does not become too difficult for a novice to benefit from.

9.1 Panther utilities will offer a consistent full screen mouse driven interface, as well as command line support : Editor, Setup, Format, Undelete, DiskOpt, FileLink BackUp, Restore, DOSBook, SStor/FDISK, .
   * *A full screen interface removes the user from the C: prompt is easier and often more intuitive to use.*

9.2 A default parameter to TIMEOUT in Config.Sys will be available with Panther.
   * *There is currently no option to default the TIMEOUT to "yes" as opposed to "no"*

9.3 Panther will support extended screen and menuing commands.
   * *While many users will have a simple configuration, possibly setting up one or two applications only, others will have a more complex system involving multiple configurations, networks, DTP packages requiring LIM,CD ROMs etc are all possible options. The Panther Menuing Facility will allow a novice to set up a menu to be displayed following boot up, and giving the user the ability to easily install the various configuration options.*

9.4 Panther will include keyboard macro support i.e.configurable keystrokes and history.
   * *To offer similar capability to that already available in MS-DOS 5.0 and IBM DOS 5.x, Panther will allow the user to establish keyboard macros within Editor. This will not only offer parity to competitive products but provide real ease of use functionality for the user.*

9.5 Panther will include an entertaining on line tutorial.
   * *For both the novice and the more advanced user, the complexity of Panther will be simply explained in an on line tutorial. The on line tutorial will take the user through all aspects of the products, explaining in simple terms who the user can gain maximum benefit from each aspect of the functions.*

9.6 Panther will extend, as appropriate, all config.sys commands and batch file processing e.g. " IF " parsing to be available in config.sys

9.7 Panther will support error level testing of device drivers.

9.8 Panther will offer a simplified installation with auto detection of third party drivers

9.9 Panther will be fully downloadable from the network server.
   * *For many Computer Managers the benefits to be enjoyed by upgrading to DR DOS are negated by the physical chore of having to load DR DOS separately onto every machine. By making Panther fully downloadable from the network, the network manager will be able to upgrade all of the PCs on a network easier and quicker.*

401159

9.10 Panther will be fully configurable from the supervisor console for any workstation on the network.
This will assist Computer Managers in controlling the system and is essential as part of the tighter integration between the client and the network operating system

9.11 DOSBook will be immediately available to the user by pressing F1 under TaskMax or in the Panther multitasking mode.

C0070424

MS-CCP-MDL 5010757

10. Internationalisation

10.1 Panther will have world-wide availability over a 120 day three phase period.
Panther will be available in :

Phase One : At launch - English, French, German, Italian, Spanish, Portuguese, Dutch, Japanese

Phase Two : within 60 days of launch : Canadian French , Norwegian, Swedish, Finish, Danish, Brazilian Portuguese, Russian.

Phase Three : within 60 days of phase two : Russian, Thai, Hungal, Kanji, Chinese, Simplified Chinese, Traditional Chinese, Hebrew and Arabic.

10.2 Panther will support Thai, Greek, Turkish and Icelandic keyboard and codepage.

10.3 Panther will offer compatibility to current IBM DOS Hebrew and Arabic (BIDI) ·

10.4 Panther code will be 100% DBCS (Double Byte Character Set) enabled

10.5 Panther will be compatible with IBM DBCS 5.x

10.6 The IBM DOS/V BIOS interface will be implemented for Panther

10 .7 Panther will offer a bilingual capability (messages, switches and change environment commands between DBCS and SBCS.

10.8 Availability of a translation kit

11 Documentation

11.1 Panther documentation will include only generic references to DOS

11.2 Panther documentation will be available in a Quick Start Manual, Full Documentation, Tips and Hints, System Programmers Guide

11.3 Panther documentation will be included in total in a hypertext based on line manual

This page intentionally left blank.