DATACOM

DM4000 – Series

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DM4000 Metro Ethernet Series

The DATACOM DM4000 Switches line offers reliable and high performance solutions for metro LAN and corporate networks.

Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, as well as support for copper or fiber are offered in a wire speed non-blocking architecture, according each MPU capacity.

By offering L2/ VPNs and TDM circuit emulation, associated to a Carrier Class architecture, we are able to place our DM4000 line as a comprehensive and cost effective solution to telecommunication companies and major corporate clients. DmView application software may be used for centralized management, as it offers a Graphical User Interface (GUI) that allows monitoring the status and failures, configuration management and inventory of the units.

Products are manageable and modular, with different interface options, which make possible to select the most suitable option for every need. The interface cards support OIR (Online Insertion and Removal). The chassis comes in different sizes, depending on the number of slots available, and supports the most varied interface cards, control cards, and redundant power input.

The DATACOM multilayer switches allows the implementation of QoS (Quality of Service), traffic control, high availability and security functions, as well as wire speed L2, L3 and MPLS commutation. This way, it is possible to build an infrastructure that meets the growing demand for convergent applications.

DM4000 Series products are homologated by ANATEL in accordance with the procedures regulated by Resolution No. 242/2000 and meets the technical requirements applied, including exposure limits of Specific Absorption Rate related to electric fields, magnetic and electromagnetic radio frequency, according to Resolution No. 303/2002.

Besides these certifications, DATACOM DM4000 Series is in accordance with many other international standard norms, such as MEF CE2.0 and IEC 60950.

For further information, access the website www.anatel.gov.br.

Main Features

Wire Speed L2, L3 & MPLS

The DM4000 Switches line includes switch fabric of up to 512Gbit/s (more than 380Mpps for 64 bytes packets), complete L2, L3 (IPv4/v6) and MPLS package switching is always performed in hardware (wire speed), so as to ensure low latency in switching. The filter/meter/ACLs functions are performed by the ASIC, without impact on the performance of the CPU unit or the forwarding of packages.

The layer 2 and 3 protocols are implemented in software in order to assemble the MAC address, IP routes and MPLS label tables (push/pop/swap). The DM4000 has a high RAM memory capacity, enabling a large storage of software tables (RIB, MRIB, LRIB, L2RIB, etc.). Besides that, it also provides a high processing capacity (CPU), enabling it to support an elevated protocol scalability, route processing and rapid convergence of traffic in hardware.

IP/MPLS Networks

DM4000 Switches line supports IP (IPv4 and IPv6) both static and dynamic routing – RIPv2, OSPFv2, OSPFv3(3) and BGP4. It is possible to assemble a great variety of IPv4/IPv6 applications, with routing executed in hardware, not affecting the equipment's performance, even when using 1Gbit/s, 10Gbit/s interfaces or LAG (Link Aggregation).

TLS – Transparent LAN Services – may be implemented through L2 VPN over MPLS.

DM4000 may be used in MPLS network as LER (Label Edge Router) or LSR (Label Switch Router).

For the MPLS infrastructure, it is possible the establishment of LSPs or unidirectional paths in the MPLS network, through LDP or RSVP-TE protocols, as well as LDP over RSVP-TE tunneling feature support. The RSVP-TE protocol provides support to FRR feature (Fast ReRoute), which allow the establishment of backup RSVP tunnels (detour). In an eventual network failure, the main tunnel is commuted to the detour tunnel, performing times of convergency near 50ms.

LSPs may be assembled over interfaces 1Gbit/s (electrical or optical), 10Gbit/s (XFP) and interfaces 802.3ad (LAG).

Using LDP infrasctructure, it is possible to use the MPLS VPN services in configuration such as: point-to-point (VPWS), point-multipoint (VPLS) and in hierarquical mode (H-VPLS), named L2VPNoLDP.

Using RSVP infrasctructure, it is possible to implement the service L2VPN-TE, which use a RSVP tunnel as destination (L2VPNoRSVP). If the infrastructure contains the LDP and RSVP protocols, this service is named L2VPNoLDPoRSVP.

For L2VPN applications is possible to carry Ethernet frames in VC-Type Ethernet or VLAN modes.

In an IP/MPLS application scenario, is also possible to implement multicast IPTV services, using protocols as OSPF and PIM for IPv4/IPv6 in layer 3, ensuring an infrastructure enabled to assemble a multiservice network.

Chassis

DM4000 chassis solution supports up to eight interface modules and two hot-swappable redundant MPU modules. The DM4004 and DM4008 uses passive backplane and redundant power source supplies. The connection between MPU and interface modules is assembled over a topology which is protected against failures, ensuring full redundancy for data paths. The system is distributed and modular, both in the hardware (dataplane) and software (controlplane) levels.

Each interface module is equipped with CPU, memory and its own cross-switch in order to work either in the standalone system (DM4001 version) or in a chassis with distributed system (DM4004 with 4 slots for interface cards or DM4008 with 8 slots for interface cards) with MPUs.

Software

The DATACOM switches software architecture is based on a modular architecture platform, both in the application and operating levels. This way it is possible to reset software processes individually, define different priorities for critical processes, among other possibilities.

Control plane is performed separately from routing plane. This way, data traffic is not affected by control traffic. Control level protocols define the configuration actions that will be transferred to the hardware of the device which runs the functions in wire speed mode.

Software processing is split into the main processor unit and the processors present on interface modules. Packets are routed in a distributed way between the interface modules and the MPU. Local traffic does not require switching via matrix switch.

Traffic between interface modules will be routed to the MPU and from there to the final destination port.

Management Facilities

A complete centralized FCAPS management is available through the DATACOM's management software, the DmView, with sending traps with alarms and events in the system, on either Windows, Linux or Solaris platforms, and with full redundancy. The device has a CLI – Command Line Interface – with automatic assistance in the syntax of commands and parameters, and is accessible through SSHv2, Telnet, and RS-232 Console. The protocols SNMPv1, v2c and v3 over IPv4 and IPv6 using authentication and/or cryptography, and 4 RMON groups are also available.

Besides in-band management, DM4000 Switches family has an Ethernet interface for out-of-band management.

The in-band management of the DM4000 switches can be made via loopback IP address (virtual) or its VLAN interface IP address. The accesses to the equipment's configuration are protected by passwords in accordance to the level attributed for each user. Is also possible the usage of external services RADIUS or TACACS+ to limit the commands executed by the user.

Access and management both inband or out-of-band are possible via WEB (HTTP and/or HTTPs), CLI or through console interface (RJ45 connector).

Tools are available for network and cabling infrastructure and connectivity diagnostics, including Digital Diagnostic (SFF-8472). Cables may be tested for interruptions or cable failures, through specific commands for diagnoses.

Another important tool, available in DM4000 Series is the monitoring of processess and consumption of the CPU and memory of the switches, allowing an accompaniment and analisys of the devices performance.

DM4000 provides, in hardware, the ports or packet flow monitoring functionality. It does not affect the performance of DM4000, and it can forward the data traffic to a specific port.

DATACOM DM4000 Series stores up to 10 different configurations and two firmware versions in the memory. Through the flash configuration is possible to choose which configuration and firmware version will be loaded in the equipment initialization.

Supports resolution of IPv4 and IPv6 (DNS IPv4/v6) for equipment names (hostnames), easing management actions via Telnet and SSH, for example.

QoS Implementation Facilities

DM4000 Switches family has eight QoS queues per port, implementing it in hardware, without impact in the equipment's performance.

The QoS policies are implemented through many techniques, such as prioritization algorithms that allow a wide range of definitions, such as definition of priority for certain data flows, weight

configuration for each queue, minimum flow rate definition, or even a mix of these techniques. The configuration can be made by using IEEE 802.1p standard, IP Precedence or DSCP fields, TCP/UDP ports, among others. The QoS policies can be attributed to physical interface (1Gbit/s or 10Gbit/s) or to the logical interface (i.e. Port Channel).

Filter/meter/ACL functions are executed by the ASIC, not affecting the CPU performance or data forwarding.

The Bandwidth control has a granularity of 64kbit/s on the definition of CIR (Committed Information Rate) and PIR (Peak Information Rate), and may be applied to either the input or output port traffic, or to a specific packet flow through the use of HW filters, or yet hierarchically (HQoS) [3].

The filters are quite flexible features, allowing multiple matches and actions on the packets. Some of filter options supported are listed below:

- Match: 802.1p, all, destination-ip, destination-mac, destination-port, dscp, ethertype, protocol, source-ip, source-mac, source-port, tos-bits, tos-precedence, vlan, etc.
- Action: Permit, deny, 802.1p, 802.1p-from-tos, counter, drop-precedence, dscp, egress-block, int-802.1p, pkt-802.1p, pkt-802.1p-from-tos, redirect-port, etc.

Security

Switch Family has mechanisms that guarantee secure operation and maintenance of the installed devices. Communication protocols use cryptography and it is possible to specify, through HW filters, which units of the network may have management access to other devices.

A highly secure and trustworthy management structure may be built through local and remote Syslog, user authentication, authorization and accounting (AAA) through RADIUS and TACACS+, email alarm notification, single clock via SNTP, protection against Denial of Service (DoS/DDoS) attacks and port authentication via 802.1x.

For Metro Ethernet applications, the number of MAC addresses available may be limited per port and per VLAN; L2 and L3 protection mechanisms may be used against DoS/DDoS attacks, and bandwidth may be limited for broadcast, multicast and destination lookup failure (DLF) traffic. It is also possible to send TRAPs via SNMP protocol for scheduled events or violation attempts.

VLANs

The assemble of Virtual LANs in DM4000 Switches may use 4,096 VLANs defined in IEEE 802.1q standard simultaneously, offering double tagging (Q-in-Q) functionality and enabling the creation of TLS services (Some VLANs can be allocated for internal use, remaining 4,094 VLANs for effective use). VLANs may be defined by protocol, by MAC address and by IP-subnet. Ports may be overlapped on port-based VLANs.

The DM4000 Switch family also provide the feature Private VLAN. The Private VLAN feature enables to define sub-domains where the sub-domain members are able to communicate or not between each other, according the sub-domain type: Isolated or Community. In addition it is possible to define Promiscuous members that can communicate with all members of the Private VLAN.

Access Control Lists / Filters

The DM4000 Switches line also allows the creation of complex Access Control Lists (ACLs) and filters in hardware, with multiple comparison and action parameters, which makes it possible for packets to be changed, sent, discarded or prioritized in both logical and physical interfaces.

The interface modules have input and output filters that can perform matches such as: source IPv4/v6, destination IPv4/v6, source TCP/UDP port, destination TCP/UDP port, protocol, source and destination MAC address, DSCP marking, etc.

Filters can associate actions that are performed in hardware such as: Packet discard, 802.1q priority remarking, and bandwidth throttling limitation, to name a few.

The filters can be associated to the counter feature in order to obtain statistics about packets or sent/received bytes. This information is available via CLI, or it also can be exported via SNMP management interface. The many match options enables a great variety of monitoring methods of data flow, VLAN/VPN traffic, etc.

Additionally, the model cards E/H Series have an output filter. See table of filters capacity values of DM4000 hardware for each type of interface modules.

Protection Mechanisms

In layer 2, Spanning Tree protocols are available, including Rapid Spanning Tree (RSTP), which has shorter conversion times, Multiple Spanning Tree (MSTP) for better resource allocation and greater scalability, as well as the Ethernet Automatic Protection Switching (EAPS), Ethernet Ring Protection Switching (ERPS) and ITU-T G.8032 (including Amendment A) protocols, which are specific for sub-50ms Ethernet rings. Through link aggregation functionality (LAG), it is possible to group physical ports into logic ports, with automatic load balancing and recovering with typical sub-200ms times. In DM4004 and DM4008 chassis is available the feature to aggregate physical ports from interface cards which are placed in different slots. It enables the design of Metro Ethernet application topologies with protection and short failure recovery times.

Troubleshooting

DM4000 family provides many resources designed to debug protocols or anomalies in network or devices performance.

Among the various debug mechanisms available are:

- Syslog (supporting multiple servers)
- RMON
- Debug Log
- Mirroring or Monitor (is possible to mirror the traffic of many ports, with various VLANs to a specific port – n:1, and it is also possible build mirroring system based on VLAN)
- DSCP and 802.1p
- RSPAN (mirror the traffic of many ports into one VLAN)
- TACACS
- RADIUS
- SNMP

Multicast L2 e L3

Designed for multicast applications, DM4000 handles multicast L2 & L3 packets on hardware. DM4000 supports protocols IGMP v1/v2/v3, MLD v1/v2, PIM-SM with hardware support for encapsulation of PIM-Register messages, according to RFC4601, and PIM-SSM function, according to RFC4607. DR election and Rendezvous Point (RP) configuration in static mode or via BootStrap are supported as well.

OAM Ethernet

DM4000 Switches support End-to-End OAM (CFM) according to IEEE 802.1ag and ITU-T Y.1731 standards. This enables proactively monitoring of the connectivity (Continuity Check) and isolating faults through Loopback Messages (ping L2) and Link trace Messages (traceroute L2).

Point-to-Point OAM (EFM) according to IEEE 802.3ah is also supported. It enables fault indications, including Dying Gasp, Unidirectional Link and Critical Event.

EFM operates with a configurable interval between PDUs, for interoperability with other vendors. Another management possibility can be made through E-LMI (MEF 16), in order to perform the automatic configuration of the device.

Pseudowire TDM

Designed to meet the convergence applications of services developed for the new packet network, DM4000 enables the use of pseudowire (PWE3) technology for the emulation of attributes essential to the TDM service(4).

Circuit emulation is performed on a E1 channel, and E1 electrical ports and STM-1 optical ports are available as interface. It also supports E1 grooming (Nx64 kbit/s).

PTP – Precision Time Protocol

Aiming to meet Telecom requirements for network synchronization, DM4000 uses the PTP (Precision Timing Protocol) technology as per IEEE 1588-2008 (v2) specification(1).

DM4000 may operate both as Master and Slave of the PTP connection. In the Master mode, the device allows the connection to an external synch source.

DM4000 Interface Modules

ETH48GX H Series

Interface card 48-port Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 96Gbit/s, with 48 Gigabit SFP ports (100/1000Base-X or SGMII). As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP Modules are sold separately.

ETH48GT H Series

Interface card 48-port Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 96Gbit/s, with 48 electrical ports 10/100/1000Base-T ports with RJ45 connectors. As an option, it is capable of supporting MPLS LER/LSR/VPN.

ETH24GX+2x10GX H Series

Interface card 24-port Gigabit plus two port 10 Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 88Gbit/s, with 24 Gigabit SFP ports (100/1000Base-X or SGMII) and two 10 Gigabit XFP ports. As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP and XFP Modules are sold separately.

ETH24GX+2x10GX E Series

Interface card 24-port Gigabit plus two port 10 Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. With reduced L2 and L3 forwarding tables, it has a standalone bandwidth of 88Gbit/s, with 24 Gigabit SFP ports (100/1000Base-X or SGMII) and two 10 Gigabit XFP ports. As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP and XFP Modules are sold separately.

ETH24GX H Series

Interface card 24-port Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 48Gbit/s, with 24 Gigabit SFP ports (100/1000Base-X or SGMII). As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP Modules are sold separately.

ETH24GT H Series

Interface card 24-port Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 48Gbit/s, with 24 10/100/1000Base-T ports in RJ45 connectors. As an option, it is capable of supporting MPLS LER/LSR/VPN.

ETH24GX E Series

Interface card 24-port Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. With reduced L2 and L3 forwarding tables, it has a standalone bandwidth of 48Gbit/s, with 24 Gigabit SFP ports (100/1000Base-X or SGMII). As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP Modules are sold separately.

ETH2x10GX H Series

Interface card 2-port 10 Gigabit Ethernet for DM4000 Switches. It is compatible with the 4 and 8-slot version of the chassis, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 40Gbit/s, with two 10G XFP ports. As an option, it is capable of supporting MPLS LER/LSR/VPN. XFP Modules are sold separately.

ETH4x10GX H Series

Interface card 4-port 10 Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 80Gbit/s, with four 10G XFP ports. As an option, it is capable of supporting MPLS LER/LSR/VPN. XFP Modules are sold separately.

ETH4x10GX E Series

Interface card with 4-port 10 Gigabit Ethernet for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. With reduced L2 and L3 forwarding tables, it has a standalone bandwidth of 80Gbit/s, with four 10G XFP ports. As an option, it is capable of supporting MPLS LER/LSR/VPN. XFP Modules are sold separately.

PWE3 ETH20GX+32E1 H Series

Interface card with 20-port Gigabit Ethernet plus 32-port E1 for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 40Gbit/s SFP ports (100/1000Base-X or SGMII) and 32 E1 electrical ports. Card equipped to offer PWE3 TDM. It supports IEEE 1588-2008 (v2) standard. As an option, it is capable of supporting MPLS LER/LSR/VPN. It requires a RB-13 connection panel for interconnection with E1s. SFP modules and the RB-13 connection panel are sold separately.

PWE3 ETH20GX+2x10GX+32E1 H Series

Interface card with 20-port Gigabit Ethernet, 2-port 10Gbit/s Ethernet plus 32-port E1 for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 80Gbit/s, with 20 Gigabit SFP ports (100/1000Base-X or SGMII), two 10Gbit/s XFP Ethernet ports, plus 32 E1 electrical ports. Card equipped to offer PWE3 TDM. It supports IEEE 1588-2008 (v2). As an option, it is capable of supporting MPLS LER/LSR/VPN. It requires a RB-13 connection panel for interconnection with E1s. SFP and XFP modules and the RB-13 connection panel are sold separately.

PWE3 ETH16GX+4STM1 H Series

Interface card with 16-port Gigabit Ethernet plus 4-port STM-1 for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 32Gbit/s, with 16 Gigabit SFP ports (100/1000Base-X or SGMII) and four SFP STM-1 channeled optical ports. Card equipped to offer PWE3 TDM. It supports IEEE 1588-2008(v2). As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP Modules are sold separately.

PWE3 ETH16GX+2x10GX+4STM1 H Series

Interface card with 16-port Gigabit Ethernet, 2-port 10Gbit/s Ethernet plus 4-port STM-1 SFP for DM4000 Switches. It is compatible with the 1, 4 and 8-slot chassis version, and switch fabric of MPU384/MPU512. It has a standalone bandwidth of 72Gbit/s, with 16 Gigabit SFP ports (100/1000Base-X or SGMII), two 10 Gigabit XFP ports and 4 STM-1 channeled optical ports. Card

equipped to offer PWE3 TDM. It supports IEEE 1588-2008 (v2). As an option, it is capable of supporting MPLS LER/LSR/VPN. SFP and XFP Modules are sold separately.

DM4000 MPUs

MPU384

Main Processing Unit comprised of main CPU and matrix switch of 384Gbit/s. It may be used individually or in redundant configuration.

Handles up to eight interface cards at 48Gbit/s each one (up to 24 Gigabit wire speed interfaces per interface card) or up to four interface cards at 96Gbit/s each one (up to 48 Gigabit wire speed interfaces per interface card).

MPU512

Main Processing Unit comprised of main CPU and matrix switch of 512Gbit/s. It may be used individually or in redundant configuration.

Handles up to eight interface cards at 64Gbit/s each one (up to 32 Gigabit interfaces per interface card) or up to four interface cards at 96Gbit/s each one (up to 48 Gigabit interfaces per interface card).

Thefollowing table show MPU characgteristics per slot and per chassi version:

	DM4004		DM4008	
	MPU384	MPU512	MPU384	MPU512
Full Duplex Capacity per slot	48Gbit/s	48Gbit/s	24Gbit/s	32Gbit/s
Max wirespeed GE ports per slot	48	48	24	32
Max oversubscripted GE ports per slot	Always Wirespeed	Always Wirespeed	48	48
Max wirespeed 10GE ports per slot	4	4	2	3
Max oversubscripted 10GE ports per slot	Always Wirespeed	Always Wirespeed	4	4

Chassis

DM4001 Chassis

Chassis with backplane card for 19-inch racks with 1U high, capable of handling one interface card. The chassis has dual power input.

Characteristics:

- Compatible with all interface cards of DM4000 Series;
- Do not require MPU unit;
- With wire speed non-blocking capacity for all interface cards;
- Redundant power input for -48V_{DC} with redundant power supply in the interface card;
- AC chassis (100 ~ 240V) and DC chassis (-38,4 ~ -72V) are available.

The power sources DM4100 RPU 1000W, DM4100 RPU 500W and DM4100 RPU 300W, together with the connecting cables, can be used as power source for the product DM4001.

DM4004 Chassis

A 19-inch racks cabinet chassis with backplane card, capable of handling up to 4 interface cards, totaling 192x 1Gbit/s ports or 16x 10Gbit/s ports. The backplane execute the data traffic interconnections and interface cards management, enabling the device operate as single equipment controlled by MPU. In order to ensure maximum operation availability, the DM4004 chassis supports the operation with redundant MPUs, hot-swappable fan and redundant power input. DM4004 chassis is available in two models: DC (6U high and power input of -38,4V and -72V) and AC (7,5U high and power input of 100V or 240V).

Characteristics:

- Depends on usage of at least one MPU (Main Processor Unit);
- All interface cards works as a single unit in the management point of view. It behaves as a unique, but large-sized device, enabling the creation of logical ports and assembling of rings and other protection topologies between ports of different interface cards, increasing its availability;
- Speed fan control based on temperature information of all interface cards;
- Bandwidth optimization, using the interface card local processor to switch the traffic destined to many ports of a same interface card, not burdening the MPU;
- Redundant MPU operation (1+1), ensuring configuration maintenance and the quick service recovering in case of failure. For this operating mode, both MPUs model must be the same;
- Passive backplanes, with non-blocking switch between interface cards, until MPU switching limit;
- Redundant power input of -48V_{DC}, with redundant power supplies in each interface card;
- In AC model, it provides two redundant hot-swappable power supplies, which can be AC (100 ~ 240V) or DC (-38,4 ~ -72V).

DM4008 Chassis

A 19-inch rack chassis with backplane card, capable of handling up to 8 interface cards, totaling 384x 1Gbit/s ports or 32x 10Gbit/s ports. The backplane execute the data traffic interconnections and interface cards management, enabling the device operate as single equipment controlled by MPU. In

order to ensure maximum operation availability, the DM4008 chassis supports the operation with redundant MPUs, hot-swappable fan and redundant power input. DM4008 chassis is available in two models: DC (10U high and power input of -38.4V and -72V) and AC (11.5U high and power input of 100V ou 240V).

Characteristics:

- Depends on usage of at least one MPU (Main Processor Unit)
- All interface cards works as a single unit in the management point of view. It behaves as a unique, but large-sized device, enabling the creation of logical ports and assembling of rings and other protection topologies between ports of different interface cards, increasing its availability
- Speed fan control based on temperature information of all interface cards
- Bandwidth optimization, using the interface card local processor to switch the traffic destined to many ports of a same interface card, not burdening the MPU
- Redundant MPU operation (1+1), ensuring configuration maintenance and the quick service recovering in case of failure. For this operating mode, both MPUs model must be the same
- Passive backplanes
- Non-blocking switch between interface cards, until MPU switching limit
- Redundant power input of -48V_{DC}, with redundant power supplies in each interface card
- In AC model, it provides two redundant hot-swappable power supplies, which can be AC (100 ~ 240V) or DC (-38.4 ~ -72V)

Hardware

DM4000	*ETH48GX H Series*	*ETH24GX+2x10GX H Series*	*ETH24GX H Series*	*ETH24GX E Series*
Switch L2	Wire Speed	Wire Speed	Wire Speed	Wire Speed
Router L3	Wire Speed	Wire Speed	Wire Speed	Wire Speed
QoS	L2-L4	L2-L4	L2-L4	L2-L4
MPLS	LER/LSR	LER/LSR	LER/LSR	LER/LSR(1)
100/1000Base-X Ports (SFP)	48	24	24	24
10GbE (XFP) Ports	NA	2	NA	NA
MAC Address Table	512k(2)	512k(2)	512k(2)	32k
L3 hosts (IPv4)	4k	4k	4k	4k
L3 hosts (IPv6)	4k	4k	4k	4k
L3 Routes (IPv4)	512k(2)	512k(2)	512k(2)	16k
L3 Routes (IPv6)	256k(2)	256k(2)	256k(2)	8k
L2 Multicast groups	1k	1k	1k	1k
L3 Multicast groups (IPv4)	4k(5)	4k(5)	4k(5)	4k(5)
L3 Multicast groups (IPv6)	4k(5)	4k(5)	4k(5)	4k(5)
Filter Rules	8k	8k	8k	8k
TDM PWE3	NA	NA	NA	NA
IEEE1588-2008	NA	NA	NA	NA

DM4000	*ETH24GX+2x10GX E Series*	*ETH2x10GX H Series*	*ETH4x10GX H Series*
Switch L2	Wire Speed	Wire Speed	Wire Speed
Router L3	Wire Speed	Wire Speed	Wire Speed
QoS	L2-L4	L2-L4	L2-L4
MPLS	LER/LSR(1)	LER/LSR	LER/LSR
100/1000Base-T Ports	NA	NA	NA
100/1000Base-X Ports (SFP)	24	NA	NA
10GbE (XFP) Ports	2	2	4
MAC Address Table	32k	512k(2)	512k(2)
L3 hosts (IPv4)	4k	4k	4k
L3 hosts (IPv6)	4k	4k	4k
L3 Routes (IPv4)	16k	512k(2)	512k(2)
L3 Routes (IPv6)	8k	256k(2)	256k(2)
L2 Multicast groups	1k	1k	1k
L3 Multicast groups (IPv4)	4k(5)	4k(5)	4k(5)
L3 Multicast groups (IPv6)	4k(5)	4k(5)	4k(5)
Filter Rules	8k	8k	8k
TDM PWE3	NA	NA	NA
IEEE1588-2008	NA	NA	NA

DM4000	*ETH48GT H Series*	*ETH4x10GX E Series*	*ETH24GT H Series*
Switch L2	Wire Speed	Wire Speed	Wire Speed
Router L3	Wire Speed	Wire Speed	Wire Speed
QoS	L2-L4	L2-L4	L2-L4
MPLS	LER/LSR	NA	LER/LSR
10/100/1000Base-T Ports	48	NA	24
100/1000Base-X Ports (SFP)	NA	NA	NA
TDM Ports	NA	4	NA
MAC Address Table	512k(2)	32k	512k(2)
L3 hosts (IPv4)	4k	4k16k	4k16k
L3 hosts (IPv6)	4k	4k8k	4k8k
L3 Routes (IPv4)	512k(2)	16k	512k(2)
L3 Routes (IPv6)	256k(2)	8k	256k(2)
L2 Multicast groups	1k	1k	1k
L3 Multicast groups (IPv4)	4k(5)	4k(5)	4k(5)
L3 Multicast groups (IPv6)	4k(5)	4k(5)	4k(5)
Filter Rules	8k	8k	8k
TDM PWE3	NA	NA	NA
IEEE1588-2008	NA	NA	NA

DM4000	*PWE3 ETH20GX+ 32E1 H Series*	*PWE3 ETH20GX+ 2x10GX+32E1 H Series*	*PWE3 ETH16GX+ 4STM1 H Series*	*PWE3 ETH16GX+ 2x10GX+4STM1 H Series*
Switch L2	Wire Speed	Wire Speed	Wire Speed	Wire Speed
Router L3	Wire Speed	Wire Speed	Wire Speed	Wire Speed
QoS	L2-L4	L2-L4	L2-L4	L2-L4
MPLS	LER/LSR	LER/LSR	LER/LSR	LER/LSR
100/1000Base-X Ports (SFP)	20	20	16	16
10GbE (XFP) Ports	NA	2	NA	2
TDM Ports	32 E1 (G703)	32 E1 (G703)	4 STM1 (SFP)	4 STM1 (SFP)
MAC address table	512k(2)	512k(2)	512k(2)	512k(2)
L3 hosts (IPv4)	4k	4k	4k	4k
L3 hosts (IPv6)	4k	4k	4k	4k
L3 Routes (IPv4)	512k(2)	512k(2)	512k(2)	512k(2)
L3 Routes (IPv6)	256k(2)	256k(2)	256k(2)	256k(2)
L2 Multicast groups	1k	1k	1k	1k
L3 Multicast groups (IPv4)	4k(5)	4k(5)	4k(5)	4k(5)
L3 Multicast groups (IPv6)	4k(5)	4k(5)	4k(5)	4k(5)
Filter Rules	8k	8k	8k	8k
TDM PWE3	SAToP / CESoPSN / MEF8	SAToP / CESoPSN / MEF8	SAToP / CESoPSN / MEF8	SAToP / CESoPSN / MEF8
IEEE1588-2008	Yes	Yes	Yes	Yes

DM4000 Software

Characteristics	Details
Flow Control	Backpressure in half duplex; PAUSE (IEEE 802.3x) in full duplex
Interface Basic Parameters	Description, MDI/MDIX, Speed Mode and Duplex Mode, Flow Control,
	Port MTU Size, GARP, Link-Flap detection, Port-Channel, switchport
Auto-negotiation	Speed, duplex mode, flow control and MDI/MDIX
Management	**HTTP/HTTPs** Access with more than one simultaneous access
	Remote Management of Network Devices through the protocol **RDM**
	SNMP v1/v2c/v3 over IPv4 and IPv6
	Command Line Interface (CLI) via SSHv2 (IPv4/IPv6), Telnet (IPv4/IPv6) and Conso RJ45, USB(1) or RS232
	RMON groups 1 (statistics), 2 (historic), 3 (alarms) and 9 (events)
	ACL configuration with multiple comparisons and actions
	Network Diagnostic Tools (telnet, traceroute, ping) IPv4 and IPv6
	Cabling Diagnostic Tool
	Up to **2 firmwares** in flash, with upgrade via SCP, TFTP or HTTP/HTTPS
	Up to **10 configurations** in flash, with upload or download via SCP, TFTP or **HTTP/HTTPS**
	Actions Scheduling through commands script
	XML Management Interface supporting cryptography
	OAM (**EFM – IEEE 802.3ah, CFM – IEEE 802.1ag, AIS, RDI and E-LMI**)
	Link Layer Discovery Protocol (**LLDP – IEEE 802.1ab**)
	Traffic Monitoring via SNMP to interface traffic and CPU usage and processor memory
	Remote equipment management "**IP less**" IEEE 802.3ah extension
	SNMP access to **QoS Counter**
	Static or dynamic IP address through **DHCP**

Characteristics	Details
Management	**DHCP relay (RFC 2131) with option 82**
	DHCP for **IPv6**
	NTP / SNTP
Security	**IEEE 802.1x** with **guest vlan, restricted vlan** and **vlan assignment**
	Filters in HW to **access control SNMP, Web, Telnet and SSH**
	MAC Address Limit configurable per port and per VLAN
	Allow only **Authorized DHCP Servers**
	Syslog Local and Remote with support to **Multiples Syslog Servers**
	Mutual Authentication (two-way-party authentication), authorization and accounting (**AAA**) **Local** and **TACACS+** and authentication and accounting **RADIUS**
	E-mail notification (SMTP)
	Protection Mechanisms against **Denial of Service attacks (DoS/DDoS), MAC Move**
VLAN	VLAN Tagging with 4094 VIDs in simultaneous usage (**IEEE 802.1q**)
	Port-based, with ports overlap possibility
	Protocol-based (IEEE 802.1v), **MAC-based**, **IP-Subnet based** (1)
	Q-in-Q double tagging, Selective Q-in-Q
	Communication Separation between interfaces of the same **VLAN** or broadcast domain
	VLAN Translate allowing insertion, removal or swap
	Inter-VLAN Routing (IPv4/v6)
Protection	**Classic Spanning Tree** (IEEE 802.1d) up to 16 instances
	Rapid Spanning Tree (IEEE 802.1w) up to 16 instances
	Per-VLAN Rapid Spanning Tree up to 16 instances
	Multiple Spanning Tree (IEEE 802.1s)
	Backup-Link
	Monitoring of network link status through **Link State Tracking**
	Loopback Detection

Characteristics	Details
Protection	**BPDU Guard**
	Protection Against DOS in IP and ARP Spoofing
	Link flap
	Ethernet Automatic Protection Switching **(EAPS)**
	Ethernet Ring Protection Switching **(ERPS)**
QoS: Marking Classifying Priorization	**8 queues** per port in hardware
	Packet classification though layers 2, 3 and 4
	TCI tagging (**IEEE 802.1p**), **IP Precedence/TOS** or **DSCP/TOS**
	Source/Destination IP and/or **MAC** and/or **TCP/UDP ports**
	Packet classification and marking based on MPLS-EXP field
	Filter rules
	Rate Shaping (Ingress e Egress) in hardware, with granularity of **64 kbit/s** per **port** and per **traffic flow** in **CIR** and **PIR** definition
	Weighted Round Robin, Weighted Fair Queuing, Strict Priority or a combination of these techniques as queue scheduling algorithm
	Hierarquical QoS **(HQoS)** (3)
	Weighted Random Early Detection **(WRED)** support
Link Aggregation	Dynamic or static configuration via **LACP** (IEEE 802.3ad)
	Up to **128 logical groups**, with **8 active ports** in each group
	Equivalent use to non-aggregated links for L2, L3, MPLS and QoS functions
	Configurable Load Balance Criteria (i.e MAC, IP, ...).
L2 Functionalities	Maximum **Broadcast, Multicast and DLF** rate, controlled by port
	IGMP (v1/v2/v3) fore **Snooping**, **Query** and **SSM Mapping** functions
	Aging L2 global
	Tunneling of protocols **L2 (TLS)**
	MAC Learning Disabling per port or per VLAN.
	Multicast VLAN Registration **(MVR)**
	Captive Portal

Characteristics	Details
	Port Authentication **IEEE 802.1x via MAC** in Radius Server (RADA)
	RSPAN Remote Switched Port Analyzer
L2 Functionalities	**Traffic Monitor** for **ports** (4 MTP simultaneous sessions) and/or **packets flow IPFIX rate 1:1000**(3)
	Statics MAC Addresses attribution per interface, broadcast and multicast
L3 Functionalities	**Static Routing** (IPv4/v6(3))
	RIPv2, OSPF v2/v3(3) and **BGP v4**
	Dual-stack Layer IPv4/IPv6(3) (RFC 4213)
	Packets Tunneling IPv6 in IPv4 (6over4)
	VRRP Redundancy (including *dual stack* IPv4/IPv6)
	PIM Protocol IPv4/IPv6(3)
	IP Local Proxy ARP
	Policy Based Routing (**PBR**) in hardware
	Equal-Cost Multi-Path **(ECMP)**
	Route Redistribution among protocols (static, RIPv2, OSPF, BGP)
	Non Stop Routing for OSPF, BGP and LDP
	MD5 Authentication for OSPFv2/v3(3) and BGP protocols
	route-map and **prefix-list** to filtering and conditional announcement of routes
	Support to **Jumbo Frame** of up to 9KB
	Suport for up to 4k L3 interfaces (VLAN with configured IP)
MPLS	**VPWS** - L2 VPN over MPLS (**Draft Martini**) and **Backup PW**
	VPLS – Virtual LAN Services and H-VPLS – Hierarchical VPLS
	Label Distribution Protocol (**LDP**)
	Resource Reservation Prot-Traffic Engineering (RSVP-TE) with Fast Reroute (FRR)
	Resource Reservation Protocol (**RSVP**)
	Time to Live **(TTL)** Processing in Multi-Protocol Label Switching (**MPLS**) Networks
	LDP Tunneling over RSVP-TE

Characteristics	Details
	The USE of **RSVP** with IETF Integrated Service (INTERSERV)
PWE3	TDM Circuit Emulation via **SaToP** (4)
	Circuit Emulation via **CESoPSN** (4)
PWE3	Synchronism through Standard **IEEE 1588-2008** (v2) (1)
	MEF 8 Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks

Main Standards to Comply With

In the following will be presented a list with the main standards which DATACOM DM4000 Series comply with. In order to obtain a complete list or to solve any doubts about a specific standard, please, get contact with DATACOM Technical Support.

IEEE

802.1ab	Link Layer Discovery Protocol (LLDP)
802.1ad	Provider Bridges
802.1ag	Connectivity Fault Management (CFM)
802.1d	Bridging
802.1F	Common Definitions and Procedures for IEEE 802 Management Information
802.1p	Priority Support
802.1q	Virtual LAN
802.1q-in-q	VLAN Stacking
802.1s	Multiple Spanning Tree (MSTP)
802.1t	802.1D Maintenance
802.1u	802.1Q Maintenance
802.1v	VLAN Classification by Protocol and Port
802.1x	Port Security
802.1y	802.1D Maintenance
802.1w	Rapid Spanning Tree
802.3	10Base-T
802.3ab	1000Base-T
802.3ac	Extension for VLAN Tagging
802.3ad	Link Aggregation (LAG)
802.3ah	Ethernet First Mile (EFM)
802.3ae	10GBase-SR/LR/ER/SW/LW/EW
802.3i	10Base-T 10 Mbit/s (1.25 MB/s)
802.3u	100Base-TX
802.3x	Flow Control

802.3z	1000Base-SX/LX
1588-2008	Precision Clock Synchronization Protocol (PTP)

ITU-T

Y.1453	TDM-IP interworking – User plane interworking
Y.1731	OAM functions and mechanisms for Ethernet based networks

MEF

8	MEF 8 – Circuit Emulation Services over Ethernet (CESoETH)
9	MEF 9 - Abstract Test Suite for Ethernet Services at the UNI
14	MEF 14 - Abstract Test Suite for Traffic Management Phase 1
24	MEF 24 Abstract Test Suite for UNI Type 2 Part 2 E-LMI

IETF

RFC854	Telnet Protocol Specification
RFC1027	Using ARP to Implement Transparent Subnet Gateways
RFC1305	NTP (V3) Specification, Implementation and Analysis
RFC1492	An Access Control Protocol, Sometimes Called TACACS
RFC1812	Requirements for IP Version 4 Routers (IPv4)
RFC1886	DNS Extensions to support IP version 6
RFC2030	Simple Network Time Protocol (SNTP)
RFC2104	HMAC: Keyed-Hashing for Message Authentication
RFC2131	DHCP/BOOTP Relay
RFC2138	Remote Authentication Dial In User Service (RADIUS)
RFC2139	Remote Authentication Dial In User Server (RADIUS)
RFC2375	IPv6 Multicast Address Assignments
RFC2460	IPv6 Specification(3)
RFC2461	IPv6 Neighbor Discovery(3)
RFC2462	IPv6 Stateless Address Auto configuration
RFC2464	Transmission of IPv6 over Ethernet Networks(3)

RFC2544	Benchmarking Methodology for Network Interconnect Devices
RFC2865	Remote Authentication Dial In User Server (RADIUS)
RFC2866	RADIUS Accounting
RFC2711	IPv6 Router Alert Option
RFC3021	Using 31-Bit Prefixes on IPv4 Point-to-Point Links
RFC3164	The BSD Syslog Protocol
RFC3176	In Mon Corporation's SFLOW(3)
RFC3272	Overview and Principles of Internet Traffic Engineering
RFC3513	IPv6 Addressing Architecture
RFC3579	RADIUS Support for EAP
RFC3587	IPv6 Global Unicast Address Format(3)
RFC3596	DNS Extensions to Support IP Version 6
RFC3619	Ethernet Automatic Protection Switching (EAPS) version 1
RFC3917	Requirements for IP Flow Information Export (IPFIX)
RFC4213	Transmission Mechanisms for IPv6 Hosts/Routers – Dual Layer
RFC4250	The Secure Shell (SSH) Protocol Assigned Numbers
RFC4251	The Secure Shell (SSH) Protocol Architecture
RFC4252	The Secure Shell (SSH) Authentication Protocol
RFC4253	The Secure Shell (SSH) Transport Layer Protocol
RFC4254	The Secure Shell (SSH) Connection Protocol
RFC4291	IPv6 Addressing Architecture(3)
RFC4443	ICMPv6(3)
RFC4861	Neighbor Discovery for IP version 6 (IPv6)
RFC4862	IPv6 Stateless Address Auto-Configuration(3)
RFC5101	Specification of the IP Flow Information Export (IPFIX)(3)
RFC5095	Deprecation of Type 0 Routing Headers in IPv6
RFC5517	Private VLANs: Scalable Security in a Multi-Client Environment

Routing

RFC1058	RIP Version 1 - Routing Information Protocol
RFC1723	RIP Version 2 - Carrying Additional Information
RFC1965	Autonomous System Confederations for BGP
RFC1997	BGP Communities Attribute
RFC1998	BGP Community Attribute in Multi-home Routing
RFC2080	RIPng
RFC2082	RIP Version 2 MD5 Authentication
RFC2154	OSPF with Digital Signatures
RFC2328	OSPF Version 2
RFC2329	OSPF Standardization Report
RFC2338	Virtual Router Redundancy Protocol
RFC2370	The OSPF Opaque LSA Option
RFC2385	Protection of BGP Sessions via the TCP MD5 Signature Option
RFC2439	BGP Route Flap Damping
RFC2453	RIP Version 2
RFC2545	Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
RFC2740	OSPF for IPv6 (OSPFv3)(3)
RFC2796	BGP Route Reflector An Alternative to Full Mesh BGP
RFC2842	Capabilities Advertisement with BGP-4
RFC2858	Multiprotocol Extensions for BGP-4
RFC2918	Route Refresh Capability for BGP-4
RFC3021	Using 31-Bit Prefixes on IPv4 Point-to-Point Links
RFC3065	Autonomous System Confederations for BGP
RFC3101	The OSPF NSSA Option
RFC3107	Carrying Label Information in BGP-4
RFC3137	OSPF Stub Router Advertisement
RFC3315	Dynamic Host Configuration Protocol for IPv6
RFC3392	Capabilities Advertisement with BGP-4

RFC3623	Graceful OSPF Restart
RFC3630	Traffic Engineering (TE) Extensions to OSPF Version 2
RFC3768	Virtual Router Redundancy Protocol (VRRP)
RFC4271	A Border Gateway Protocol 4 (BGP-4)
RFC4360	BGP Extended Communities Attribute
RFC4724	Graceful Restart Mechanism for BGP
RFC4760	Multiprotocol Extensions for BGP-4
RFC4893	BGP Support for Four-octet AS Number Space
RFC5065	Autonomous System Confederations for BGP
RFC5187	OSPFv3 Graceful Restart
RFC5250	The OSPF Opaque LSA Option
RFC5340	OSPF for IPv6
RFC5396	Textual Representation of Autonomous System (AS) Numbers
RFC5492	Capabilities Advertisement with BGP-4

Multicast

RFC1112	Host extensions for IP multicasting
RFC2236	Internet Group Management Protocol, Version 2
RFC2710	Multicast Listener Discovery (MLD) for IPv6
RFC3376	Internet Group Management Protocol, Version 3
RFC3569	An Overview of Source-Specific Multicast (SSM)
RFC3810	Multicast Listener Discovery Version 2 (MLDv2) for IPv6
RFC4541	Considerations for IGMP and MLD Snooping Switches
RFC4601	Protocol Independent Multicast – Sparse Mode (PIM-SM)
RFC4604	Using IGMP Version 3 for Source Specific Multicast and MLDv2
RFC4607	Source-Specific Multicast for IP
RFC4608	Source-Specific Protocol Independent Multicast in 232/8

MPLS

RFC2205	RSVP v1 Functional Specification
RFC2209	Resource ReSerVation Protocol (RSVP) - Version 1 Message Processing
RFC2210	The USE of RSVP with IETF Integrated Service
RFC2702	Requirements for traffic engineering over MPLS
RFC2961	RSVP Refresh Overhead Reduction Extensions
RFC3031	MPLS architecture
RFC3032	MPLS label stack encoding
RFC3036	LDP specification
RFC3037	LDP applicability
RFC3209	Extensions to RSVP for LSP tunnels
RFC3210	Applicability statement for extensions to RSVP for LSP Tunnels
RFC3215	LDP state machine
RFC3270	Multi-protocol label switching (MPLS) support of differentiated services
RFC3346	Applicability Statement for Traffic Engineering with MPLS
RFC3443	TTL processing in multiprotocol label switching (MPLS) networks
RFC3469	Framework for MPLS-based recovery
RFC3478	Graceful Restart Mechanism for Label Distribution Protocol
RFC3916	Requirements for Pseudo-Wire Emulation Edge-to-Edge (PWE3)
RFC3936	Procedures for Modifying the Resource Reservation Protocol (RSVP)
RFC3985	Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture
RFC4090	Fast reroute extensions to RSVP-TE for LSP tunnels
RFC4221	MPLS management overview
RFC4377	OAM Requirements for MPLS Networks
RFC4378	A framework for MPLS Operation and Management
RFC4379	Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures
RFC4446	IANA Allocations for Pseudowire Edge to Edge Emulation (PWE3)
RFC4447	Pseudowire Setup and Maintenance Using the LDP
RFC4448	Encapsulation methods for transport of Ethernet over MPLS

RFC4664	Framework for L2VPNs
RFC4665	Service Requirements for Layer 2 Provider-Provisioned VPN
RFC4762	Virtual Private LAN Service (VPLS) Using LDP Signaling
RFC4905	Encapsulation Methods for Transport of Layer 2 Frames Over MPLS
RFC4906	Transport of Layer 2 Frames Over MPLS
RFC5036	LDP Specification
RFC5443	LDP IGP Synchronization

QoS

RFC2309	Queue Management and Congestion Avoidance in the Internet
RFC2474	Definition of the differentiated services field (DS) in IPv4
RFC2475	An architecture for differentiated services
RFC2597	Assured Forwarding PHB Group
RFC2598	An Expedited Forwarding PHB
RFC2697	A single rate three color marker
RFC2698	A two rate three color marker
RFC3140	Per hop behavior identification codes
RFC3246	An expedited forwarding PHB
RFC3644	Policy quality of service (QoS) Information model
RFC3670	Information model for describing network device QoS datapath

MIB and SNMP

RFC1157	Simple Network Management Protocol (SNMP)
RFC1212	Concise MIB Definitions
RFC1213	MIB for Network Management of TCP/IP-based internets: MIB-II
RFC1215	A Convention for Defining Traps for use with the SNMP
RFC1229	Extensions to the generic-interface MIB
RFC1441	SNMPv2 Protocol Framework
RFC1493	Definitions of Managed Objects for Bridges

RFC1573	Evolution of the Interfaces Group of MIB-II
RFC1643	Definitions of Managed Objects for the Ethernet-like Interface Types
RFC1724	RIP Version 2 MIB Extension
RFC1757	Remote Network Monitoring Management Information Base
RFC1850	OSPF Version 2 Management Information Base
RFC1901	Introduction to Community-based SNMPv2
RFC1902	Structure of Management Information for Version 2 of SNMPv2
RFC1903	Textual Conventions for Version 2 of SNMPv2
RFC1904	Conformance Statements for Version 2 of SNMPv2
RFC1905	Protocol Operations for Version 2 of SNMPv2
RFC1906	Transport Mappings for the SNMP
RFC1907	Management Information Base (MIB) for SNMPv2
RFC1908	Coexistence between V1 and V2 of the Internet-standard NMF
RFC2021	Remote Network Monitoring MIBv2 using SMIv2
RFC2037	Entity MIB using SMIv2
RFC2233	The Interfaces Group MIB using SMIv2
RFC2358	Definitions of Managed Objects for the Ethernet-like Interface Types
RFC2570	Introduction to V3 of the Internet-standard NMF
RFC2571	An Architecture for Describing SNMP Management Framework
RFC2572	Message Processing and Dispatching for SNMP
RFC2573	SNMP Applications
RFC2574	USM for version 3 of SNMPv3
RFC2575	VACM for SNMP
RFC2576	Coexistence between SNMP v1,v2,v3
RFC2578	Structure of Management Information for SNMPv2
RFC2579	Textual Conventions for SNMPv2
RFC2580	Conformance Statements for SMIv2
RFC2665	Definitions of Managed Objects for the Ethernet-like Interface Types
RFC2674	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast

RFC2787	Definitions of Managed Objects for the VRRP(1)
RFC2819	Remote Network Monitoring MIB
RFC2863	The Interfaces Group MIB
RFC3411	An Architecture for Describing SNMP Management Framework
RFC3412	Message Processing and Dispatching for SNMP
RFC3413	SNMP Application
RFC3414	User-based Security Model for SNMPv3
RFC3415	View-based Access Control Model for SNMP
RFC3416	Protocol Operations for SNMPv2
RFC3417	Transport Mappings for the SNMP
RFC3418	Management Information Base (MIB) for SNMPv2
RFC3635	Definitions of Managed Objects for the Ethernet-like Interface Types
RFC4188	Definitions of Managed Objects for Bridges
RFC4273	Definitions of Managed Objects for BGP-4 using SMIv2(1)
RFC4292	IP Forwarding Table MIB
RFC4293	MIB for the Internet Protocol
RFC4363	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast

PWE3

RFC4197	Requirements for Edge-to-Edge Emulation of Time Division Multiplexed
RFC4553	Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)
RFC5086	Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service

DRAFT IETF

pwe3-redundancy-bit-04	Pseudowire Preferential Forwarding Status Bit

Accessories

- DM4000 SFP-SX: MM, 850nm, reach 550m, connector LC
- DM4000 SFP-LX: SM, 1310nm, reach 10km, connector LC
- DM4000 SFP-LX+: SM, 1310nm, reach 30km, connector LC
- DM4000 SFP-LH: SM, 1550nm, reach 80km, connector LC
- DM4000 SFP-LZ: SM, 1550nm, reach 110km, connector LC

- DM4000 SFP-BX: SM, 1310/1550nm, reach 20km, connector LC
- DM4000 SFP-BX+: SM, 1310/1550nm, reach 60km, connector LC
- DM4000 SFP-ZX: SM, 1550nm, reach 80km, connector LC
- DM4000 SFP-T: electrical transceiver UTP, 10/100/1000 pattern 802.3ab
- DM4000 XFP-SR: MM, 850nm, reach 300m, connector LC
- DM4000 XFP-LR: SM, 1310nm, reach 10km, connector LC
- DM4000 XFP-BR20: SM, 1270nm TX / 1330nm RX, reach 20km, connector LC
- DM4000 XFP-BR20: SM, 1330nm TX / 1270nm RX, reach 20km, connector LC
- DM4000 XFP-ER: SM, 1550nm, reach 40km, connector LC
- DM4000 XFP-ZR: SM, 1550nm, reach 80km, connector LC
- DM4000 XFP-ZR+: SM, 1550nm, reach 80km, connector LC
- DM4000 BP-MPU: MPU Blank Panel
- DM4000 BP-IC: IC Blank Panel
- DM4000 AC – PSU1000 – AC Power Source AC - 1000W
- RB-13 – BNC: Connection Panel to 19-inch racks", 32x E1 75 Ohms BNC
- RB-13 – IEC: Connection Panel to 19-inch racks, 32x E1 75 Ohms IEC
- RB-13 – RJ45: Connection Panel to 19-inch racks, 32x E1 120 Ohms RJ45
- RB-20 – IEC: Connection Panel to DID, 16x E1 75 Ohms IEC
- Cable LFH-160 to LFH-160
- Cable LFH-160 to Open

Colored Transceivers DWDM and CWDM and transceivers not listed above, are available upon request.

Obs.: All accessories mentioned above should be purchased separately

DM4000 Line of Switches participates of FINEP Economic Subvention Program

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(1) Check with Technical Support, HW and/or SW versions to support this functionality. This functionality may not be available on all configurations.

(2) Maximum values – due to flexible and configurable resource sharing of external memory with 512k entries. In the following list is possible to check some examples:

512k MAC Address table, 32k IPv4 (L3 Routes) and 16k IPv6 (L3 Routes)

32k MAC Address table, 512k IPv4 (L3 Routes) and 256k IPv6 (L3 Routes)

32k MAC Address table, 32k IPv4 (L3 Routes) and 256k IPv6 (L3 Routes)

32k MAC Address table, 256k IPv4 (L3 Routes) and 128k IPv6 (L3 Routes)

(3) Available in the E/H Series model of interface cards. For all other models, contact technical support.

(4) Only in PWE3 Interface Cards

(5) Maximum values – due to the flexible resource sharing.

Specifications and product availability presented may change without notice.