Enterasys Matrix® N-Series
Secure, Highly-Available Policy-based 10GbE Modular L2/L3/L4 Edge to Core/Data Center Flow Switch

Product Overview

The Enterasys Matrix® N-Series flow-based switches offer the industry’s most granular visibility and control of individual users and voice/video/data applications. Capable of being deployed as a premium edge access device, distribution layer aggregation switch, enterprise-class core router, or data center server farm solution, the Matrix N-Series is the flagship hardware platform for the policy-based Secure Networks™ architecture. Policies ensure only the right users have access to the right information from the right place at the right time — adapting automatically every time there is a move, add or change.

Matrix N-Series switches are available in the following form factors:

- Standalone for smaller wiring closets
- 1 Slot chassis providing full Distributed Forwarding Engine (DFE) connectivity
- 3 Slot offering over 200 ports of connectivity
- 5 Slot optimized for PoE deployments while offering over 350 ports
- 7 Slot offering over 500 ports of connectivity

All of the Matrix N-Series offerings leverage the Enterasys DFE architecture whereby the switching, routing and management control functions are embedded in each module, delivering unsurpassed reliability, scalability and fault tolerance. Customers can quickly and cost-effectively add connectivity as needed while scaling performance capacity with each new blade. The DFE high-availability architecture makes forwarding decisions, enforces security policies and classifies/prioritizes traffic. DFEs ensure the highest Quality of Service for critical applications such as voice even during periods of over-subscription — while proactively preventing Denial of Service attacks.

Benefits

Business Alignment
- Standards-based, open architecture for reliable and secure deployment of next generation business critical applications
- Best in class QoS functionality ensures reliable and intratable performance for convergence-based applications plus integrated support for standards-based Power over Ethernet
- Matrix N-Series flow-based architecture delivers end-to-end visibility and control over users, services and applications ensuring consistent end-user experience 24x7x365

Operational Efficiency
- Lowest TCO for any product in its class, featuring a 10 year chassis life with guaranteed backward compatibility plus continued performance and density enhancements to meet future enterprise networking requirements
- Deployment flexibility significantly drives down maintenance costs and simplifies management
- Lowest power consumption and thermal output BTU/Hour drives down data center power and cooling costs

Security
- Unrivalled capability to protect business traffic from malicious attacks and maintain data integrity and application delivery
- Edge security extended to existing switches and wireless access points allows authentication of thousands of users or devices simultaneously on a single port
- Integrated network access control (NAC) and intrusion detection & prevention (IDS/IPS) via Matrix Security Modules

Support and Services
- Industry leading customer satisfaction and first call resolution rates
- Personalized services

There is nothing more important than our customers.
Unlike competing solutions, the Matrix N-Series implements a granular flow based architecture to intelligently manage individual user and application conversations—not just ports or VLANs. Policy rules combined with deep packet inspection can intelligently sense and automatically respond to security threats while improving reliability and quality of the user experience. NetFlow data can be collected at wire-speed without sacrificing performance or requiring sampling techniques. Matrix® N-Series is also the only enterprise switch to support multi-user, multi-method authentication on every port — absolutely essential when you have phones, computers, printers, copiers, security cameras and badge readers on the network. When security matters, there is no better choice than the Matrix N-Series.

System Summary

Multiple Platforms to Fit Any Environment

The Matrix N-Series family of flow-based switches bring high performance distributed switching to the wiring closet, distribution layer, enterprise core and data center. The N-Series portfolio consists of the 7-slot Matrix N7, 5-slot Matrix N5, 3-slot Matrix N3 and the 1-slot Matrix N1 chassis offerings that accept Diamond, Platinum and Gold DFE blades and Network Expansion Modules. Delivering some of the highest switching port densities available in the market today and scaling to provide overall system capacities of 1.68 Terabits, all chassis support standards based Power-over-Ethernet, either via an external power shelf or as a fully integrated power system in the Matrix N5. Distributed Forwarding Engines can be installed in any chassis and their innovative design dramatically reduces startup costs since there is no need to purchase additional components such as supervisor engines, router modules or management modules. Matrix® N-Series deliver next generation performance with 10 Gigabit Ethernet uplinks and aggregation.

<table>
<thead>
<tr>
<th></th>
<th>Matrix N1</th>
<th>Matrix N3</th>
<th>Matrix N5</th>
<th>Matrix N7</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFE Module Slots</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Switching Throughput</td>
<td>13.5 Mpps</td>
<td>40.5 Mpps</td>
<td>67.5 Mpps</td>
<td>94.5 Mpps</td>
</tr>
<tr>
<td>Total Backplane Capacity</td>
<td>80 Gbps</td>
<td>240 Gbps</td>
<td>800 Gbps</td>
<td>1.68 Tbps</td>
</tr>
<tr>
<td>10/100 ports per system</td>
<td>72</td>
<td>216</td>
<td>360</td>
<td>504</td>
</tr>
<tr>
<td>100 Base-FX ports per system</td>
<td>54</td>
<td>162</td>
<td>270</td>
<td>378</td>
</tr>
<tr>
<td>10/100/1000 ports per system</td>
<td>72</td>
<td>216</td>
<td>360</td>
<td>504</td>
</tr>
<tr>
<td>10/100/1000 PoE ports per system</td>
<td>48</td>
<td>144</td>
<td>360</td>
<td>336</td>
</tr>
<tr>
<td>1000 Base-X ports per system</td>
<td>24</td>
<td>72</td>
<td>120</td>
<td>168</td>
</tr>
<tr>
<td>10 Gigabit ports per system</td>
<td>4</td>
<td>12</td>
<td>20</td>
<td>28</td>
</tr>
</tbody>
</table>

The Matrix N Stand Alone (NSA) solution provides a premium edge switch for smaller wiring closets or data center server clusters. This product provides 48-ports of 10/100/1000 connectivity plus four modular Gigabit uplink ports (SFP). It is a 2RU standalone switch that supports all N-Series Platinum DFE features and includes redundant AC power supplies.

Matrix N1 System Bundles – Two 24 port, triple speed fixed configuration N1 solution bundles provide cost effective, advanced functionality solutions for smaller wiring closet or data center applications. One bundle incorporates modular Gigabit Ethernet uplink support.
Architectural Overview

Distributed Forwarding Engines (DFEs)
The Matrix N-Series Distributed Forwarding Engines (DFEs) support over 18 Gbps of switch capacity per blade and deliver fully distributed switch management and route processing capabilities, where each interface module is individually driven and managed by on-board processors. Enterasys flow-based nTERA ASICs, together with firmware microprocessors, create a traffic control solution that delivers high performance and flexibility. This distributed ASIC-based architecture increases processing power as modules are added for a higher level of scalability at significantly smaller startup costs than competing solutions which are typically built around centralized switch fabrics and supervisor management modules.

DFEs are available in a wide array of interface types to address varied network requirements including 10/100Base-TX, 10/100/1000Base-TX, 100Base-FX, 1000Base-X and 10-Gigabit Ethernet. Selected DFE modules are also available with integrated PoE. Some DFEs provide an added level of flexibility by including Network Expansion Module (NEM) slots. This further simplifies network design and reduces the cost of network deployments. Current Network Expansion Modules (NEMs) include support for Matrix Security Modules for NAC and IDS/IPS, six 1000Base-X ports and 10 Gigabit Ethernet connectivity.

In addition to providing port expansion, Network Expansion Modules allow enterprises to integrate security applications, including the award-winning Enterasys Dragon® IDS/IPS technology, directly into the Matrix™ N-Series chassis with the Matrix Security Module. The Matrix Security Module is an open, all-purpose processor that provides the capability to add applications directly into the network switch infrastructure. The first applications to be integrated onto the Matrix Security Module are Dragon® Intrusion Defense and Enterasys Network Access Control.

DFEs are designed for implementation for different positions within network infrastructures, offering differentiated features and price points. Diamond DFEs have been optimized for large scale multiuser policy deployments in data center server farms and at the distribution and core layers of the network. Diamond DFEs support the full range of Secure Networks features, including advanced Quality of Service (QoS) and per-user traffic rate limiting. Available in 10/100/1000, 1000 Base-X and 10 Gigabit configurations, Diamond DFE’s include additional processing power, memory, policy capacity expansion and advanced routing licenses for medium to large enterprise backbone and distribution-layer routing applications.

Platinum DFEs support the full range of Secure Networks features, but are primarily designed for deployment in access and distribution roles, with support for up to 1000 downstream users/devices on a single port (2000 per chassis) with full distributed fault-tolerance capabilities. The advanced routing license (N-EOS-L3) and per-port policy capacity license (N-EOS-PPC) can be purchased in order to provide similar multi user authentication and routing scalability as the Diamond DFEs. Platinum DFEs provide a broad range of Ethernet connectivity ranging from 10/100 to 10 Gigabit Ethernet, including support for Power over Ethernet. Gold DFEs are designed specifically for high-density, 10/100, 10/100/1000 and 100FX network edge/access applications, with options for Power over Ethernet.

Gold DFEs deliver scalable performance and flexibility to ensure comprehensive switching, QoS, security, and bandwidth control, providing a more cost-effective option for customers deploying flow-based switching at the edge of the network. Gold DFEs support 2 unique users per port (typically a workstation and a VoIP handset) in contrast to Platinum and Diamond which support up to 1,000 users/devices per port. Through an optional software upgrade (N-EOS-RED), Gold DFE modules can support 1+1 redundancy for mission critical network applications.

High Performance Distributed Architecture
The Matrix N-Series was designed from inception to support high availability environments. The Matrix N-Series backplane is a point to point matrix design with fully meshed inter-switch links that provide increased scalability and performance. Since there are no active backplane components, there is no single point of failure. The inter-switch links can support up to 80 Gbps of switching capacity per link. Total system aggregate switching capacity scales to 1.68 Tbps.

The Matrix N-Series unique distributed architecture provides considerable advantages when compared to solutions that rely on centralised processing modules:

- **N+6 High availability**
- **Performance scales as modules are added**
- **Inherent backwards compatibility and future proofing provides market leading Return on Investment**
- **Scalability; Port Density and Performance**
- **Low Latency; Each module has a connection to every other module**
- **Modules are automatically upgraded and configured as they are plugged into the system**

Fully Distributed Passive Backplane

Gold DFE modules can support 1+1 redundancy for mission critical network applications.
Features

Enabling Secure Networks

An integral part of the Secure Networks architecture from Enterasys, the Matrix N-Series provides advanced security, priority and bandwidth control mechanisms without compromising network performance. Secure Networks leverages the distributed, flow-based visibility and advanced policy-based control of the Matrix N-Series.

NetFlow Without Compromise

Network performance management and security capabilities via NetFlow are available on every Matrix N-Series DFE without slowing down switching/routing performance or requiring the purchase of expensive daughter cards for every blade. Enterasys tracks every packet in every flow as opposed to competitor’s statistical sampling techniques.

The Matrix N-Series’ distributed, flow-based architecture allows for a very granular level of visibility and control for each user and application conversation, or flow, while simultaneously handling a large volume of traffic. The distributed architecture enables each switch module in a Matrix N-Series chassis to function independently of other modules and eliminates single points of failure. Each chassis is managed as a single system using a single IP address. This capability is unique in the industry and provides security and management automation.

Distributed Flow-Based Architecture

In order to ensure granular visibility and control of traffic is maintained, without sacrificing performance, the Matrix N-Series deploys a distributed, flow-based architecture. This architecture ensures that when a specific communications flow is being established between two end points, the first packets in that communication are processed through the multilayer classification engine in the switch. In this process, the role is identified, the applicable policies are determined, the frames are inspected, and the action is determined. After the flow is identified, all subsequent frames associated with that flow are automatically handled in ASICs without any further processing. If that flow were to change in any way, a new flow would be identified and new policies would be applied. In this way the Matrix N-Series is able to apply a very granular level of control to each flow without sacrificing performance.

Multi-User Authentication and Policy

Authentication allows enterprise organizations to control network access and provides mobility to users and devices. It provides a way to know who or what is connected to the network and where this connection is at any time. Matrix N-Series has unique, market leading capabilities regarding the types of simultaneous authentication methods. DFEs can support multiple concurrent authentication techniques, including 802.1X authentication; MAC authentication, which is a way to authenticate devices on the network using the MAC address; and Web-Based authentication, also known as Port Web Authentication (PWA), where a user name and password are supplied through a browser. This capability provides great flexibility to enterprises looking to implement access control mechanisms across their infrastructure.
A significant additional feature of Matrix N-Series is the capability to support Multi-User Authentication, this means that multiple users/devices can be connected to the same physical port, and that each one can be authenticated individually using one of the multi-method options (802.1x, MAC or PWA).

The value exists in the ability to authorize multiple users, either using dynamic policy or VLAN assignment for each authenticated user. In the case of dynamic policy, this is called Multi-User Policy.

Multi-user port capacities with the Matrix N-Series are determined on a per port, per DFE and per multi-slot system basis. Default Platinum DFE capacities are as follows:

- Per port: 8 - 128
- Per blade (DFE): 1024
- Per chassis: 1024

It is possible to increase these capacities by purchasing additional licences. The N-EOS-PPC license increases user port capacity on a per DFE basis from the default capacity of 8-128 to a maximum of 1024. When present, the N-EOS-PUC upgrade license sets the chassis capacity at 2048 users per system, this can be overridden using a CLI command setting the maximum of 2048 users/port. N-EOS-PPC and N-EOS-PUC are not available for Gold DFEs and are an optional purchase for Platinum DFEs. Diamond DFEs include N-EOS-PPC.

Multi-user authentication and policy can provide significant benefits to customers by extending security services to users and devices connected to unmanaged devices, third party switches/routers, VPN concentrators or wireless LAN access points at the edge of their network. Security, priority and bandwidth control are enhanced while protecting existing network investments.

Enterasys Operating System (EOS) Feature Summary

Integrated Services Design

Integrated Services Design is a key differentiator that separates the Matrix N-Series DFE from the competition. Integrated Services Design reduces the number and type of modules required to build typical wiring closet configurations, simplifying the overall network design. In turn, this significantly reduces the maintenance and sparing cost as each DFE can perform all of these services unlike competitive offerings which have a plethora of different line cards required in order to provide similar services.

**Multilayer packet classification** - enables the delivery of critical applications to specific users via traffic awareness and control.
- User, Port and Device Level (Layer 2 through 4 packet classification)
- QoS mapping to priority queues (802.1p & IP ToS/ DSCP) up to 16 queues per port
- Multiple queuing mechanisms (WFQ, WRR, etc.)
- Granular QoS/rate limiting
- VLAN to policy mapping

**Switching/VLAN services** - provides high-performance connectivity, aggregation, and rapid recovery services
- Extensive industry standards compliance (IEEE and IETF)
- Inbound and outbound bandwidth rate control per flow
- VLAN services support
  - Link aggregation (IEEE 802.3ad)
  - Multiple spanning trees (IEEE 802.1s)
  - Rapid reconfiguration of spanning tree (IEEE 802.1w)
- Flow setup throttling
Distributed IP Routing - provides dynamic traffic optimization, broadcast containment and more efficient network resilience

- Base routing features include static routes, RIPv1/RIPv2, IPv4 and Multicast routing support (DVMRP, IGMP v1/v2, PIM-SM)
- Advanced routing features are licensed separately through the purchase of N-EOS-L3 and include LSNAT, VRRP, DHCP relay, PIM, OSPF, DVMRP and Extended ACLs. Diamond DFES include advanced routing at no additional charge.

Security (User, Network and Host) - protects a business against network misuse, and controls access to resources and confidential information

- User security
  - Authentication (802.1X, MAC and Web), MAC (Static and Dynamic) port locking
  - Multi-user authentication/policies
- Network security
  - Access Control Lists (ACL) – basic and extended
  - Policy-based security services (examples: spoofing, unsupported protocol access, intrusion prevention, DoS attacks limits)
- Host
  - Secure access to the Matrix N-Series via SSH, SSL, SNMP v3

Management, Control and Analysis - provide streamlined tools for maintaining network availability and health

- Configuration
  - Industry-standard CLI and web support
  - Multiple images with editable configuration files
- Network Analysis
  - SNMP v1/v2c/v3, RMON/RMON II, and SMON (rfc2613) VLAN and Stats
  - Port/VLAN mirroring (one to one, one to many, many to many)
  - Line rate NetFlow
- Automated set-up and reconfiguration
  - Replacement DFE will automatically inherit previous DFES configuration
  - New blades added to chassis will automatically be updated with active configuration and firmware

Optimized High-Availability Services

Aside from the standard high-availability features of typical wiring closet and data center switches, the Matrix N-Series includes many advanced features such as dynamic service fail-over, automatic module self-configuration, and multi-image support.

Dynamic service fail-over enables each Diamond/Platinum DFE service (e.g., host management, switching/VLANs, routing, etc.) to be automatically switched to another Diamond/Platinum DFE in an event of module or process failure. This “self healing” capability happens in milliseconds because each service is replicated on every Diamond/Platinum DFE.

Automatic module self-configuration is another innovative feature that allows a DFE modules to receive their configuration from other DFES automatically. This is ideal for replacing failed modules without manually reconfiguring the replacement DFE.

Matrix N-series allow you to download and store multiple image files, this feature is useful for reverting back to a previous version in the event that a firmware upgrade fails. This multi-image support provides significant operational efficiencies especially with regard to the application of firmware patches.

Feature Rich Functionality

Examples of additional functionality and features that can be found within the Matrix N-Series include;

- NetFlow
- LSNAT
- NAT
- LLDP-MED
- Flow Setup Throttling
- Web Cache Redirect
- Node & Alias Location
- Web Cache Redirect
- Port Protection Suite

To expand on some of the above, network performance management and security capabilities via NetFlow are available on every Matrix N-Series DFE without slowing down switching/routing performance or requiring the purchase of expensive daughter cards for every blade. Enterasys tracks every packet in every flow as opposed to competitor's statistical sampling techniques. The Enterasys advantage is the nTERA ASIC capabilities that collect NetFlow statistics for every packet in every flow without sacrificing performance, Matrix™ N-Series switches can collect 9,000 flow records per second, per blade on Gold, Platinum and Diamond DFES

This is an order of magnitude greater NetFlow collection performance than any other NetFlow appliance vendor (over 60,000 flow records per second in a fully populated chassis).

Flow Setup Throttling (FST) is a proactive feature designed to mitigate zero-day threats and Denial of Service (DoS) attacks before they can wreak havoc on the network. FST directly combats the effects of zero-day and DoS attacks by limiting the number of new or established flows that can be programmed on any individual switch port. This is achieved by monitoring the new flow arrival rate and/or controlling the maximum number of allowable flows.

In network operations, it is very time consuming to locate a device or find exactly where a user is connected. This is especially important when reacting to security breaches. The Matrix N-Series DFES automatically track the network’s user/device location information by listening to the network traffic as it passes through the switch. This information is then used to populate the Node/Alias table with information such as an end-station’s (Node’s) MAC address and Layer 3 alias information (IP Address, IPX Address, etc.). This information can then be utilized by NetSight management tools to quickly determine that IP Address...
123.145.2.23 is located on switch 5 port 3 and in the event of a security breach take some form of action against that device. This node and alias functionality is unique to Enterasys and reduces the time to pinpoint the exact location of a problem from hours to minutes.

For organizations looking to deploy Voice over IP (VoIP) technologies the Matrix N-Series provides significant capabilities through its support for the industry standard discovery protocol LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices). This protocol allows for the accurate representation of network topologies within Network Management Systems (NMS), N-series switches are able to learn about all the devices connected to them understanding whether, or not, they are a VoIP phone, tell the phone which VLAN to use for voice and even negotiate the power that the phone can consume. LLDP-MED also enables 911 emergency services location functions whereby the location of a phone can be determined by the switch port to which it is connected.

N-Series support for Network Address Translation (NAT) provides a practical solution for organizations who wish to streamline their IP addressing schemes. NAT operates on a router connecting two networks, simplifying network design and conserving IP addresses. NAT can help organizations merge multiple networks together and enhances network security by helping to prevent malicious activity initiated by outside hosts from entering the corporate network, improving the reliability of local systems by stopping worms and augments privacy by discouraging scans.

Within server farm environments Matrix N-series can help to increase reliability and performance via the implementation of Load Sharing Network Address Translation (LSNAT). Based on RFC 2391, LSNAT uses a number of load sharing algorithms to transparently offload network load on a single server and distributes the load across a pool of servers.

Matrix N-series also supports a comprehensive portfolio of port protection capabilities, such as SPANguard and MACLock which provide the to detect unauthorized bridges in the network and restrict a MAC address to a specific port. Other port protection features include Link Flap, Broadcast Suppression and Spanning Tree Loop protection which protects against mis-configuration and protocol failure.

Deployment Scenarios

From the Edge to the Core

Today’s enterprise networking customers demand highly reliable, feature-rich networking devices to fulfill their requirements across all layers of the network, providing the scalability, return on investment (ROI) and security required of a 21st century business environment.

Enterasys Networks’ Matrix N-Series switches provide industry leading, high performance distributed switching for enterprise networks, providing customers with the scalability, performance and application control to meet the growing needs of today’s enterprises. Built on the award winning nTERA ASIC architecture, Matrix N-Series solutions provide high-performance, feature-rich, and highly scalable 10/100, 10/100/1000, Gigabit and 10 Gigabit Ethernet connectivity. This allows them to scale from the desktop right to the heart of the network core where they are well positioned to meet emerging high bandwidth requirements for core routing implementations.

High performance distributed computing increases the demand for secure campus networks, at the same time business critical systems and services are becoming increasingly dependant upon enterprise backbone infrastructures. Matrix N-series solutions have the capacity, scalability and QoS functionality required to deal with these new demands.

Architected to ensure no single point of failure with industry leading N+6 high availability, Matrix N-Series utilizing Diamond DFE’s are the perfect solution for core routing and secure data center applications.

At the distribution layer, Platinum DFEs deliver granular, end-to-end visibility and control over individual users, services and applications,
as well as firewall-like security on every port for downstream devices through multi-user, multimethod authentication, authorization and audit. Enterasys N-series flow switches:

• Ensure only the right users are accessing the right information from the right place at the right time.
• Discover, classify and prioritize voice and video traffic distinctly from data traffic even though a single port may have 1,000 downstream users.

Matrix N-series can also be positioned at the edge of the network enabling user/device level connectivity. High density 10/100/1000 connectivity and network access control functionality prevents the spread of worms or viruses throughout a network, protecting users within a VLAN or workgroup through quarantine and isolation of individual conversations. Additionally standards based PoE support for IP telephony services and applications ensure support for convergence applications.

Standards and Protocols

Switching / VLAN Services

• 802.1Q VLANs
• 802.1D MAC Bridges
• 802.1w Rapid-reconvergence of Spanning Tree
• 802.1s Multiple Spanning Tree
• 802.3ad Link Aggregation
• 802.3ae Gigabit Ethernet
• 802.3az 10-Gigabit Ethernet
• 802.3x Flow Control
• IP Multicast (IGMP support v1, v2, per VLAN querier offload)
• Jumbo Packet with MTU Discovery Support for Gigabit
• Link Flap Detection
• Dynamic Egress (Automated VLAN Port Configuration)
• Generic VLAN Registration Protocol (GVRP)

IP Routing

• RFC 1812 General Routing
• RFC 792 ICMP
• RFC 1256 ICMP Router Discovery Protocol
• RFC 826 ARP
• RFC 1027 Proxy ARP
• Static Routes
• RFC 1058 RIPv1
• RFC 1723 RIPv2 with Equal Cost Multipath Load Balancing
• RFC 1812 RIP Requirements
• RFC 1519 CIDR
• RFC 2338 Virtual Router Redundancy Protocol (VRRP)
• Standard ACLs
• DHCP Server RFC 1541/ Relay RFC 2131

Extended IP Routing

• RFC 1583/RFC 2328 OSPFv2
• RFC 1587 OSPFv2 NSSA
• RFC 1745 OSPF Interactions
• RFC 1746 OSPF Interactions
• RFC 1766 OSPF Database Overflow
• RFC 2154 OSPF with Digital Signatures (Password & MD5)
• OSPF with Multipath Support
• OSPF Passive Interfaces
• RFC 2391 Load Sharing using Network Address Translation
• Extended ACLs

Network Security and Policy Management

• 802.1X port based authentication
• Web based authentication (PWA+)
• MAC based authentication
• Convergence Endpoint Discovery with Dynamic Policy Mapping (Siemens HFA, Cisco VoIP, H.323 and SIP, LLDP-MED)
• Multiple authentication types per port simultaneously (802.1x, MAC, PWA+)
• Multiple authenticated Users per port with Unique Policies per User/ end system (VLAN association independent)
• RFC 3580 IEEE 802.1 Radius Usage Guidelines, with VLAN to Policy Mapping & VLAN assignment via authentication.
• Worm Suppression (Flow Set-Up Throttling)
• Broadcast Suppression
• ARP Storm Prevention
• MAC to Port Locking
• Span Guard (Spanning Tree Protection)
• Stateful Intrusion Detection System Load Balancing
• Stateful Intrusion Prevention System and Firewall Load Balancing
• Behavioral Anomaly Detection/Flow Collector (non-sampled Netflow version 5 and version 9)
• Static Multicast Group Provisioning
• Multicast Group, Sender and Receiver Policy Control
• VLAN TAG Overwrite

Class of Service

• Strict Priority Queuing
• Weighted Fair Queuing with Queue Bandwidth shaping
• 4/16 Transmit Queues per port (1000BaseX SFP)
• 4 Transmit Queues per port (10/100/1000)
• 16 Transmit Queues per port (10-Gigabit Ethernet)
• Up to 1024 Rate Limiters
• Packet count or Bandwidth based Rate Limiters.
• IP ToS/DSCP Marking/Remarking
• 802.1D Priority to Transmit Queue Mapping
Management, Control and Analysis

- SNMP v1/v2c/v3
- Web based Management Interface
- Industry Common Command Line Interface
- Multiple Software Image Support with Revision Roll Back
- Multi-configuration File Support
- Editable text based Configuration File
- COM Port Boot Prom and Image Download via ZMODEM
- Telnet Server and Client
- Secure Shell (SSHv2)
- Cabletron Discovery Protocol
- Cisco Discovery Protocol v1/v2
- IEEE 802.1AB LLDP, TIA/ANSI 1057 LLDP-MED
- Syslog
- FTP Client
- Simple Network Time Protocol (SNTP)
- Netflow version 5 and version 9
- RFC 3580 VLAN Authorization
- RFC 2865 Radius
- RFC 2866 Radius Accounting
- TACACS+ for Management Access Control
- Management VLAN
- 16 Many to One port, One to Many Ports, VLAN Mirror Sessions (64 when DFE deployed with an N1/NSA Chassis)

IETF and IEEE MIB Support

- RFC 1213 & RFC 2011 IP-MIB
- RFC 1493 Bridge MIB
- RFC 1659 RS-232 MIB
- RFC 1724 RIPv2 MIB
- RFC 1850 OSPF MIB
- RFC 2012 TCP MIB
- RFC 2013 UDP MIB
- RFC 2096 IP Forwarding Table MIB
- RFC 2276 SNMP-Community MIB
- RFC 2578 SNMPv2 SM
- RFC 2579 SNMPv2-TC
- RFC 2613 SMON MIB
- RFC 2674 802.1p/Q MIB
- RFC 2737 Entity MIB
- RFC 2787 VRRP MIB
- RFC 2819 RMON MIB (Groups 1-9)
- RFC 2863 IF MIB
- RFC 2864 IF Inverted Stack MIB
- RFC 2922 Physical Topology MIB
- RFC 3273 HC RMON MIB
- RFC 3291 INET Address MIB
- RFC 3411 SNMP Framework MIB
- RFC 3412 SNMP-MPD MIB
- RFC 3413 SNMPv3 Applications
- RFC 3414 SNMP User Based SM MIB
- RFC 3415 SNMP View Based ACM MIB
- RFC 3417 SNMPv2-TM
- RFC 3418 SNMPv2 MIB
- RFC 3621 Power Ethernet MIB
- RFC 3635 EtherLike MIB
- RFC 3636 MAU MIB
- IEEE 802.3 LAG MIB
- IEEE 802.1PAE MIB
- RSTP MIB
- USM Target Tag MIB
- U Bridge MIB
- Draft-ietf-idmr-dvmrp-v3-10 MIB
- Draft-ietf-pim-sm-v2-new-09 MIB
- SNMP-REARCH MIB
- IANA-ADDRESS-FAMILY-NUMBERS MIB

Private MIBs

- C-t-broadcast MIB
- Ctron-CDP MIB
- Ctron-Chassis MIB
- Ctron-igmp MIB
- Ctron-q-bridge-mib-ext MIB
- Ctron-rate-policying MIB
- Ctron-tx-queue-arbitration MIB
- Ctron-alias MIB
- Cisco-TC MIB
- Cisco-CDP MIB
- Cisco-netflow MIB
- Enterasys-configuration-management MIB
- Enterasys-MAC-locking MIB
- Enterasys-convergence-endpoint MIB
- Enterasys-notification-authorization MIB
- Enterasys-netflow MIB
- Enterasys-license-key MIB
- Enterasys-aaa-policy MIB
- Enterasys-class-of-service MIB
- Enterasys-multi-auth MIB
- Enterasys-mac-authentication MIB
- Enterasys-pwa MIB
- Enterasys-upn-tc MIB
- Enterasys-policy-profile MIB
- Enterasys-flow-limiting MIB

Please refer to DFE release notes for a complete list of supported MIBs

NetSight® Network Management

- NetSight Console
- NetSight Policy Manager
- NetSight Inventory Manager
- NetSight Automated Security Manager
- NetSight Sentinel
DDoS Attack Protection Tested Against

- TCP/UDP Port Scan
- Christmas Tree Attack
- Fraggle Attack
- Fragmented & Large ICMP
- ICMP Flood
- Invalid ICMP Attacks
- ICMP Re-Direct Attack
- LANd
- TCP Syn Fin Attack
- TCP Syn Flood
- Tear Drop Attack
- UDP Port Flood
- Invalid UDP Attacks
- Invalid IGMP Attacks
- Cisco Global Exploiter
- Shadowcode TTL Attack
- NTP DoS
- Open TCP Session Attacks
- Flood TCP Session

Specifications

Physical Specifications

Dimensions

Matrix NSA: 8.81 cm (3.48”) H x 144.46 cm (17.62”) W x 51.92 cm (20.44”) D
Matrix N1: 8.81 cm (3.48”) H x 144.46 cm (17.62”) W x 51.92 cm (20.44”) D
Matrix N3: 35.56 cm (14”) H x 49.53 cm (19.5”) W x 44.45 cm (17.5”) D
Matrix N5: 58.67 cm (23.1”) H x 44.45 cm (17.5”) W x 47.5 cm (18.7”) D
Matrix N7: 77.47 cm (30.5”) H x 36.83 cm (14.5”) W x 44.04 cm (17.34”) D

Power-over-Ethernet Power Shelf: 12.9 cm (5.12”) H x 44.6 cm (17.56”) W x 39.73 cm (15.7”) D

Weight

Matrix NSA: 6.36 kg (14 lbs)
Matrix N1: 6.36 kg (14 lbs)
Matrix N3: 19.1 kg (42 lbs)
Matrix N5: 27.2 kg (60 lbs)
Matrix N7: 23.6 kg (52 lbs)

Power-over-Ethernet Power Shelf: 8.2 kg (18 lbs)

Rack Mounting

19"

Rack Unit Height

Matrix NSA: 2
Matrix N1: 2
Matrix N3: 8
Matrix N5: 14
Matrix N7: 18

Power-over-Ethernet Power Shelf: 3

Power Supply Redundancy

1+1

Power Supply Wattage

Matrix NSA: 250 watts maximum
Matrix N1: 250 watts maximum
Matrix N3: 863 watts maximum
Matrix N5: 1,200 watts per supply
Matrix N7: 1,600 watts per supply

Power-over-Ethernet Power Shelf

Matrix N1, N3 and N7: External via N-POE
Matrix N5: Internal
PoE Power Supply: 1,200 watts per supply
Maximum PoE Power: 4,800 watts (4x1,200 watts)

Input Frequency

Auto ranging: 50 to 60 Hz

Input Voltage Range

Auto ranging: 100 to 125Vac, 200 to 240Vac

Input Current

Matrix NSA: 120V 3.6 Amps; 240V 1.6 Amps
Matrix N1: 120V 3.6 Amps; 240V 1.6 Amps
Matrix N3: 120V 3.6 Amps; 240V 1.6 Amps
Matrix N5: 120V 12.0 Amps; 240V 6.0 Amps
Matrix N7: Dual Input: 120V 12.0 Amps; 240V 6.0 Amps

Minimum Power Supplies

One
Environmental Specifications

Operating Temperature
5° C to +40° C (41° F to 104° F)

Storage Temperature
-30° C to 73° C (-22° F to 164° F)

Operating Humidity
5%–90% RH, non-condensing

Agency and Standards Specifications

Safety
UL 60950, CSA 60950, EN 60950, EN 60825 and IEC 60950

Electromagnetic Compatibility
47 CFR Parts 2 and 15, CSA C108.8, EN 55022, EN55024, EN 61000-3-2, EN 61000-3-3, AS/NZS CISPR22, and VCCI V-3

MTBF (Calculated) Systems
Matrix NSA: > 102,028 hours
Matrix N1: > 119,463 hours
Matrix N3: > 792,909 hours
Matrix N5: > 357,927 hours
Matrix N7: > 404,872 hours

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix NSA</td>
<td>N Standalone series with 48 port 10/100/1000 Base-TX ports via RJ45 and 4 1000Base-X ports via mini-GBIC. Includes redundant internal power supplies.</td>
</tr>
<tr>
<td>2G4072-52</td>
<td>N Standalone series with 48 port 10/100/1000 Base-TX ports via RJ45 and 4 1000Base-X ports via mini-GBIC. Includes redundant internal power supplies.</td>
</tr>
<tr>
<td>Matrix N1</td>
<td>Matrix N1 single slot chassis including redundant AC power supplies and fans</td>
</tr>
<tr>
<td>7C111</td>
<td>Matrix N1 system bundle includes 24 port 10/100/100 and Network Expansion Module slot</td>
</tr>
<tr>
<td>2G4082-25-SYS</td>
<td>Matrix N1 system bundle includes 24 port 10/100/100 and 6 port Mini GBIC Network Expansion Module</td>
</tr>
<tr>
<td>Matrix N3</td>
<td>Matrix N3 Chassis and fan tray</td>
</tr>
<tr>
<td>7C103</td>
<td>Matrix N3 Chassis and fan tray</td>
</tr>
<tr>
<td>7C203-1</td>
<td>Matrix N3 863-Watt AC power supply</td>
</tr>
<tr>
<td>7C403</td>
<td>Fan unit for Matrix N3 (spare)</td>
</tr>
<tr>
<td>N3-System</td>
<td>Matrix N3 system bundle including chassis, fan tray and one chassis power supply (North America only)</td>
</tr>
<tr>
<td>N3-System-R</td>
<td>Matrix N3 system bundle including chassis, fan tray and two chassis power supplies (North America only)</td>
</tr>
<tr>
<td>Matrix N5</td>
<td>Matrix N5 Chassis and fan tray with integrated PoE shelf</td>
</tr>
<tr>
<td>7C105-P</td>
<td>Matrix N5 Chassis and fan tray with integrated PoE shelf</td>
</tr>
<tr>
<td>7C205-1</td>
<td>Matrix N5 1200-Watt AC power supply</td>
</tr>
<tr>
<td>7C405</td>
<td>Fan unit for Matrix N5 (spare)</td>
</tr>
<tr>
<td>N5-System</td>
<td>Matrix N5 system bundle including chassis, fan tray and one chassis power supply (North America only)</td>
</tr>
<tr>
<td>N5-System-R</td>
<td>Matrix N5 system bundle including chassis, fan tray and two chassis power supplies (North America only)</td>
</tr>
<tr>
<td>Matrix N7</td>
<td>Matrix N7 Chassis and fan tray</td>
</tr>
<tr>
<td>7C107</td>
<td>Matrix N7 Chassis and fan tray</td>
</tr>
<tr>
<td>6C207-3</td>
<td>Matrix N7/E7 1600-Watt AC power supply includes two 15 Amp power outlets</td>
</tr>
<tr>
<td>6C407</td>
<td>Fan unit for Matrix N7 and E7 (spare)</td>
</tr>
<tr>
<td>N7-System</td>
<td>Matrix N7 system bundle including chassis, fan tray and one chassis power supply (North America only)</td>
</tr>
<tr>
<td>N7-System-R</td>
<td>Matrix N7 system bundle including chassis, fan tray and two chassis power supplies (North America only)</td>
</tr>
<tr>
<td>Power over Ethernet</td>
<td>Power over Ethernet power shelf (supports four 1200-Watt power supplies)</td>
</tr>
<tr>
<td>N-POE</td>
<td>Power over Ethernet power shelf (supports four 1200-Watt power supplies)</td>
</tr>
<tr>
<td>N-POE-1200W</td>
<td>1200 Watt Power over Ethernet power supply for Matrix N5 and N-POE</td>
</tr>
<tr>
<td>DFE-POE-CBL-2M</td>
<td>N-POE to DFE Power over Ethernet cable—2 Meters</td>
</tr>
</tbody>
</table>
Ordering Information (cont.)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-EOS-L3</td>
<td>Enterasys Operating System (EOS) Layer 3 routing and advanced feature package for Matrix N-Series</td>
</tr>
<tr>
<td>N-EOS-PPC</td>
<td>Enterasys Operating System (EOS) Matrix Platinum DFE port capacity increase key</td>
</tr>
<tr>
<td>N-EOS-PUC</td>
<td>Enterasys Operating System (EOS) Matrix Platinum/Diamond extra user capacity activation key</td>
</tr>
<tr>
<td>N-EOS-RED</td>
<td>Enterasys Operating System (EOS) 1+1 high availability upgrade for Matrix Gold DFEs</td>
</tr>
</tbody>
</table>

Notes
1. Please refer to DFE data sheets for information regarding connectivity modules
2. Matrix N1, N3, N5 and N7 chassis do not support 1st, 2nd and 3rd generation modules
3. Basic EOS routing is included with each DFE. EOS supports static routing and RIP
4. Only one advanced routing license is required per chassis (N1,N3,N5,N7)
5. Advanced routing license included with Diamond DFEs
6. N-EOS-L3 includes support for OSPF, DVMRP and PIM-SM

Warranty
The Matrix N-Series comes with a one year hardware warranty. There is also a 90-day software and firmware warranty to cover patches, bug fixes, and feature upgrades with 8 x 5 telephone support. For full warranty terms and conditions please go to http://www.enterasys.com/support/warranty.aspx

Service and Support
Enterasys understands that superior service and support is a critical component of Secure Networks™. The Enterasys SupportNet Portfolio—a suite of innovative and flexible service and support offerings—completes the Enterasys solution. SupportNet offers all the post-implementation support services you need—online, onsite, or over the phone—to maintain your network availability and performance.

Additional Information
For additional information on Matrix N-Series visit http://www.enterasys.com/products/switching/

Contact Us
For more information, call Enterasys Networks toll free at 1-877-801-7082, or +1-978-684-1000 and visit us on the Web at enterasys.com

Thought Leadership
Over 500 global patents

© 2008 Enterasys Networks, Inc. All rights reserved. Enterasys is a registered trademark. Secure Networks is a trademark of Enterasys Networks. All other products or services referenced herein are identified by the trademarks or service marks of their respective companies or organizations. NOTE: Enterasys Networks reserves the right to change specifications without notice. Please contact your representative to confirm current specifications.

Matrix, nTERA and NetSight are trademarks or registered trademarks of Enterasys Networks. All other products or services mentioned are identified by the trademarks or service marks of their respective companies or organizations.