In today’s marketplace, service providers want an alternative to commoditized bandwidth offerings, conventional routing, and Broadband Remote Access Server (B-RAS) platforms that limit profitability and tax valuable resources. The IPSX™ Service Processing Switch series gives you a competitive edge, enabling a maximum return on your existing network infrastructure by delivering broadband and IP service offerings that provide new revenue opportunities for years to come.

An IPSX switch combines switching, routing and service processing capabilities with a flexible operating system to deliver scalable customized network-based services that enable you to offer a broader portfolio of bundled or tiered services. The IPSX family includes:

**The IPSX 9500™ Service Processing Switch**
The 26-slot IPSX 9500 switch is ideal for Mega Point of Presence (MegaPOP) environments or when the highest levels of service scalability and operational redundancy are required.

**The IPSX 3500™ Service Processing Switch**
The 8-slot IPSX 3500 switch is best for smaller deployments where rack space is limited or the provider is just beginning to ramp up their service offerings.

Both IPSX switches can be configured with any combination of dual-slot IP Service Generators (IPSG/IPSG+)™ to deliver CoSine's full services suite—from Virtual Private Networks (VPNs) with managed firewall to Advanced Subscriber Management capabilities including Anywhere Services and Open Content Distribution. When combined with the InVision™ Service Management System (SMS) and/or the InGage™ Customer Network Management (CNM) system, you have a complete solution for service delivery. Benefits of the IPSX Service Processing Switch include:

- Customizes IP Services
- Reduces CAPEX and OPEX
- Generates New Revenue
- Scales Multi-Gigabit Services

**Unique Architecture Provides a Competitive Edge**
Conventional routing and B-RAS architectures are designed to handle a moderate volume of subscribers and a limited number of services. With a conventional system, the critical functions on the platform are all handled through a centralized route processor. This bottleneck chokes off the power of the platform, lowering the achievable performance and density while driving up cost per subscriber. Additionally, these systems have services-on-a-card architectures requiring providers to add a new card each time a service is introduced. This process decreases capacity, diminishes performance and further drives up costs. To add to the issue, conventional systems lack true virtualization of all services. Most offer a simplistic VPN Routing and Forwarding (VRF) instance designed for the narrow application of forming MultiProtocol Label Switching (MPLS) VPNs based on RFC 2547—implemented in a centralized manner.

With CoSine’s patented virtualized and distributed architecture, you have an economical solution for serving thousands of subscribers with customized IP and Broadband Services. At the heart of an IPSX switch is CoSine’s IP Network Operating System (IPNOS™), which dynamically manages the distributed software and hardware resources needed to deliver customized services to subscribers.

In offering enterprise managed IP services, IPNOS defines the Virtual Router (VR) as the fundamental building block of subscriber services. Each VR has a distinct routing and forwarding table and is essentially the equivalent of a standalone hardware router. Embedded into a single IPSX switch is the intelligence normally located in thousands of individual routers, thus delivering customized services for as many subscriber networks over a shared infrastructure.

IPNOS distributes routing responsibilities between two types of VRs:

- **Subscriber VRs (Sub VRs)**
  Customized suites of virtualized IP services are layered onto individual Sub VRs, which in effect are part of subscribers’ corporate networks.

- **Service Provider VRs (SP VRs)**
  Traffic from Sub VRs is then aggregated at the SP VR before being forwarded across your network core.
For offering broadband subscriber management services, IPSX switches extend the virtualization model to the individual subscriber level via the Virtual Subscriber Identity (VSI). Like the VR, the VSI is a powerful activation context for layering multiple services, but that operates on behalf of an individual subscriber as opposed to emulating an entire router. Unlike conventional B-RAS platforms, which can simply aggregate subscribers based on access network link-specific elements such as ATM Virtual Channels (VCs) and Point-to-Point Protocol (PPP) sessions, the VSI is completely dynamic and link agnostic. Also unlike conventional B-RAS systems, IPSX switches possess the processing power to deliver advanced services directly in the platform, which is critical for scalable service delivery.

### Scarcity

<table>
<thead>
<tr>
<th></th>
<th>IPSX 9500</th>
<th>IPSX 3500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual routers (VRs)</td>
<td>12,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Virtual IP Contacts for B-RAS</td>
<td>12,000</td>
<td>3,000</td>
</tr>
<tr>
<td>IPSec 3DES tunnels</td>
<td>120,000</td>
<td>30,000</td>
</tr>
<tr>
<td>PPPoE DSL sessions</td>
<td>240,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Virtual multicast networks</td>
<td>10,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Routes</td>
<td>12,000,000</td>
<td>3,000,000</td>
</tr>
<tr>
<td>Stateful firewalls</td>
<td>12,000</td>
<td>3,000</td>
</tr>
<tr>
<td>L2TP sessions</td>
<td>240,000</td>
<td>60,000</td>
</tr>
<tr>
<td>T1 circuits</td>
<td>4,032</td>
<td>1,008</td>
</tr>
<tr>
<td>Fractional T1 circuits</td>
<td>12,288</td>
<td>3,072</td>
</tr>
<tr>
<td>Gigabit Ethernet ports</td>
<td>48</td>
<td>12</td>
</tr>
</tbody>
</table>

**Distributed Processing Resources Ensure Scalable High Performance**

Delivering computationally intense managed services, such as VPNs with multicast capabilities, requires powerful processing resources. IPSX switches provide these and other value-added services at multi-gigabit line rates and scale their delivery to hundreds of thousands of users. Application-tailored processing engines on each IPSG/IPSG+ within an IPSX switch leverage industry-leading Central Processing Units (CPUs) and accelerators, as well as CoSine-originated silicon that hardware-accelerate key IP and broadband service functions. These distributed processing resources enable greater service delivery throughput in a single self-contained IPSG/IPSG+ than solutions that depend on centralized CPU and memory pools can provide in a fully loaded chassis, thus propelling IPSX switch scalability well beyond the competition.

**Enable the Convergence of Subscriber Management**

Advanced Subscriber Management (ASM) presents a new service paradigm that supports advanced connectivity and bundled service options across your portfolio of access technologies. With its IPSG architecture, the IPSX switch provides an intrinsically scalable and resilient platform, allowing you to offer ASM capability in the most flexible manner possible.
CoSine Services Suite Generates New Revenue Streams

Today, you need more than just one or two value-added services to meet subscriber requirements and stay ahead of the competition. Whether you want to deliver managed IP services to business customers or rich broadband offerings to consumers, the IPSX switches offer the flexibility and processing capabilities needed to deliver a rich portfolio of services.

In the security area alone, subscribers expect a unified global VPN solution for on-net and off-net sites and remote users. For you, that means being able to integrate IPSec site-to-site, dial and MPLS VPN solutions cohesively, which is no small challenge. Add to this a managed firewall and you have a complex service that requires a powerful solution.

For broadband subscribers, you now have the option to move beyond basic Internet access with a product that enables you to offer the triple play services (video, voice and data) that you cannot offer to consumers today. Additionally, the IPSX switches allow you to deliver two new service models: Anywhere Services and Open Content Distribution. Anywhere Services, enabled by the IPSX switch’s services-centric B-RAS features in combination with its virtualized architecture, allow you to create a dynamic virtual instance of the consumer’s preferences in the IPSX switch that can be accessed from any broadband access method (e.g.: a computer, wireless phone or local hotspot connection). You can offer consumers a whole new level of entertainment and information that can be accessed around-the-clock. Open Content Distribution, enabled by CoSine's services-centric B-RAS features in combination with its virtualized and distributed architecture, is a solution that transforms your network into a broadcast mechanism for video and real-time services. With Open Contribution Distribution, you make content distribution available to a broader array of content providers—whether it is a large media conglomerate or a private entrepreneur. Open Content Distribution enables you to cost-effectively combine virtualized multicast with a managed VPN to offer thousands of content providers simultaneous broadband video networks that operate independently of each other.

With an IPSX switch, you can offer a full suite of services for enterprises or consumers. The CoSine Services Suite includes:

- **VPNs:** site-to-site (IPSec, MPLS, L2TP, PPTP) and remote access
- **Triple play services** (video, voice and data)
- **ICSAs certified CoSine-originated IP Stateful Firewall (IPSF™)**
- **DSL Network Aggregation (DNA)**
- **Frame Relay integration:** IP-enabled Frame Relay, Frame Relay to IPSec interworking
- **Network Address Translation (NAT) and Port Address Translation (PAT)**
- **DoSShield™:** Denial of Service (DoS) protection
- **Extranets**
- **Anywhere Services**
- **Open Content Distribution**
- **Public Key Infrastructure (PKI)**
- **IP Class of Service (CoS) and Quality of Service (QoS)**

Carrier-Class Reliability Guarantees Non-Stop Operation

IPSX switches are built for service providers’ networks, providing all the carrier-class features necessary to ensure that subscribers continually have network access for their mission-critical applications. IPSX switches provide redundancy of all critical components with the ability to immediately recover from component failure. IPSX switches are NEBS Level 3 compliant and have hot-swap capabilities to ensure a network will continue to function when changes are made. With an IPSX switch, you are assured the highest level of system availability.

- **NEBS Level 3 global certification**
- **Hot-swappable IPSG/IPSG+ service and management blades**
- **Hot-swappable, redundant power supplies**
- **Thermal sensors on IPSG/IPSG+ service blades, management blades and fans**
- **BGPv4 dual homing for redundancy to the service providers’ core**
- **Failover capabilities for IPSG/IPSG+ service blades and management blades with an N+1 redundant pool**
- **Fully distributed routing via discrete VRs prevents a single point of failure**
- **Virtual Routing Redundancy Protocol (VRRP)**
- **Critical Resource Management—intelligent redundancy based not only on VR state but also on critical related resources such as routes, routing peers and interfaces**
- **Dual counter-rotating rings support primary and protected ring capabilities**

<table>
<thead>
<tr>
<th>IPSG/IPSG+ Connectivity Options</th>
<th>Densities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per IPSG/IPSG+</td>
</tr>
<tr>
<td><strong>Line Interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>1-port Gigabit Ethernet</td>
<td>1 port</td>
</tr>
<tr>
<td>1-port OC-12/STM-4 POS</td>
<td>1 port</td>
</tr>
<tr>
<td>4-port OC-3/STM-1 POS</td>
<td>4 port</td>
</tr>
<tr>
<td>9-port DS3c/DS3UNI/E3UNI</td>
<td>9 ports</td>
</tr>
<tr>
<td></td>
<td>252 T1s</td>
</tr>
<tr>
<td></td>
<td>3,072 DS0s</td>
</tr>
<tr>
<td><strong>Network Modules</strong></td>
<td></td>
</tr>
<tr>
<td>1-port Gigabit Ethernet</td>
<td>3 ports</td>
</tr>
<tr>
<td>4-port OC-3/STM-1 ATM</td>
<td>12 ports</td>
</tr>
<tr>
<td>4-port OC-3/STM-1 Channelized</td>
<td>12 ports</td>
</tr>
<tr>
<td>1-port OC-12/STM-4 ATM</td>
<td>3 ports</td>
</tr>
</tbody>
</table>
Features and Specifications

Routing
• Static routes
• RIP v1 (RFC 1058), RIP v2 (RFC 2453)
• OSPF v2 (RFC 2328)
• BGP-4 (RFC 1771)
• MP-BGP (RFC 2858)
• IS-IS (RFC 1142)
• ECMP routing
• Policy-based forwarding
• Private addressing (RFC 1918)
• NAT, NAT-T (RFC 2663)
• IGMPv2 proxy (RFC 2236)
• PIM-SM

Layer 2 Encapsulations
• VLAN IEEE 802.1q
• PPP (RFC 1661)
• MultiProtocol over Frame Relay (RFC 2427)
• Frame Relay UNI (FRF.1) HDLC, ATM PVC, MLPPP
  (RFC 1990)

MultiProtocol Label Switching (MPLS)
• Tag Switching (RFC 2105)
• Traffic Engineering (RFC 2702)
• MPLS architecture (RFC 3031) and related IETF drafts
• Explicit, best effort (SPF) and dynamic (CSFP) routes
• Label Stack Encoding (RFC 3032)
• OSPF, IS-IS traffic engineering extensions
• RSVP-TE, LDP (RFC 3036)
• BGP/MPLS VPs (RFC 2547)
• Layer 2 MPLS VPNs (Martini, related IETF drafts), VPLS

Tunneling Support
• Fully meshed site-to-site IPsec VPNs
• Dial tunnel termination: PPTP, IPSec, L2TP, GRE
• IPsec dial client support for CoSine VPN client and
  Windows® 2000/XP, L2TP Network Server (LNS)/L2TP Access
  Concentrator (RFC 2661), L2TP tunnel switching
• IPass™ global VPN roaming support

Security Services
• ICSA-certified firewall
• IPsec support (RFCs 2401-2412): IPsec compression,
  Authentication Header (AH) (RFC 2402), Encapsulating
  Security Payload (ESP) (RFC 2406), Internet Key Exchange
  (IKE) (RFC 2409)
• Encryption: RC4, DES and 3DES (RFCs 1829, 1851)
• Support for VeriSign®, Entrust®, Baltimore™, Netscape®
  and other PKCS #10 compliant Certificate Authorities
• Private addressing (RFC 1918)
• DoSShield for DoS protection
• ACLs

Quality of Service (QoS)
• IPv4 TOS, DiffServ marking per VR, per VI, per ACL
• DiffServ PHB: EF, AF
• VI burst rate control
• IP traffic policing
• WRED
• Metering and marking based on dual token bucket
  (RFC 2698)
• Eight strict priority and WRR queues per logical interface
  and on the midplane
• DiffServ mapping to MPLS FECs

Frame Relay Integration Services
• IP-enabled Frame Relay
• Frame Relay to IPsec interworking

Secure DSL Services
• PPP over Ethernet (RFC 2516)
• PPP over ATM (RFC 2364)
• PPP over FR (RFC 1973)
• IP over ATM (RFC 1483), bridged and routed
• PPP terminated aggregation
• DHCP Relay (RFC 2131), automatic session detection

Authentication, Authorization and Accounting
• RADIUS (RFC 2138, 2139)
• X.509 Digital Certificates
• RSA SecurID Tokens
• XAUTH
• LDAP (RFC 2251)

Regulatory Compliance
• EMC Emissions FCC Part 15 Class A
• EMC Immunity GR-1089-CORE
• CE Mark
• Safety UL 1950
• CSA 22.2-No.950

Operations
• CoSine IPNOS
• CoSine InVision SMS
• CoSine InGage™ CNM system
• SNMP v2c (RFC 1902)
• Out of band through RS-232 synchronous port
• Telnet

Power Consumption (fully loaded)
• IPSX 9500 4500 W
• IPSX 3500 1500 W

Operating Environment
• Temperature 0 to 40° C (32° to 104° F)
• Humidity 10 to 90% (non-condensing)

Physical Characteristics
Dimensions (HxWxD)
• IPSX 9500 37.0 x 17.5 x 20.5" (940 x 445 x 521 mm)
• IPSX 3500 22.8 x 17.5 x 14" (578 x 445 x 356 mm)

Weight (fully loaded)
• IPSX 9500 345 lb (155 kg)
• IPSX 3500 150 lb (68.2 kg)
• Power Input 220 V AC, –48 V DC

Features and Specifications subject to change without notice.

Fujitsu Network Communications Inc.
2801 Telecom Parkway, Richardson, TX 75082
Tel: 800.777.FAST Fax: 972.479.6900
www.fujitsu.com/us/telecom

© Copyright 2004 Fujitsu Network Communications Inc. All rights reserved.
FASST (and design)™ is a trademark of Fujitsu Network Communications Inc. (USA)
FUJITSU (and design)® and THE POSSIBILITIES ARE INFINITE™ are trademarks of Fujitsu Limited.
All other trademarks are the property of their respective owners.