Summary

Bay Networks announces the BayStack™ 350 Autosense Switch, a low-cost, full-featured, multimedia-ready Fast Ethernet switch with autosense switching technology. The switch is the newest member of the BayStack Ethernet switching family.

Two versions of the BayStack 350 switch are available: the Model 350T and Model 350F switches. The Model 350T offers 16 autosense 10/100BASE-TX ports. The Model 350F features 12 autosense 10/100BASE-TX ports and two 100BASE-FX fiber ports.

Each autosense port on the switch supports wire speed connectivity at full- or half-duplex to either 10BASE-T legacy workstations and shared media hubs, or 100BASE-TX Fast Ethernet connections to high-speed servers, workstations, and other switches. The Model 350F switch also provides full-duplex, redundant fiber uplinks to data centers via its 100BASE-FX ports.

The combination of the low cost-per-port and richness of features offered by the BayStack 350 switches provides a cost-effective solution ideal for deployment in today's 10 Mbps LAN environments. As network performance requirements increase, any equipment upgrades from 10 Mbps to 100 Mbps will be autosensed and supported without administrative intervention.

Today's increasingly powerful workstations and servers are being purchased with 10/100 Mbps network interface cards (NICs) under the assumption that throughput speeds of 10 Mbps will not be sufficient in the long term. The BayStack 350 switches deliver a plug-and-play design that is fully capable of automatic switchover to 100 Mbps operation at any time.

The performance and full feature set of the BayStack 350 switches makes them ideal for use as workgroup segment switches for 10 Mbps and 100 Mbps shared media hubs, as aggregation switches for 10 Mbps desktop switches, or direct connections to power desktops. The advanced autosense design

means that local high-speed server connections are no longer limited to only one or two Fast Ethernet connections, as in traditional 10+100 Mbps switches, because all BayStack 350 switch ports operate at 10 Mbps or 100 Mbps.

The switch provides line rate performance, and feature a 1.2 gigabit-per-second (Gbps) switching fabric, a 1.6 million packet-per-second (pps) forwarding rate, and custom switching ASICs. These high-capacity, high-throughput switches are the industry's most suitable and affordable solution for power workgroups engaged in bandwidth-intensive applications such as CAD/CAM.

The BayStack 350 switches are fully compatible with the entire BayStack solution set and are tightly integrated with the industry-leading Bay Networks Optivity® network management system.
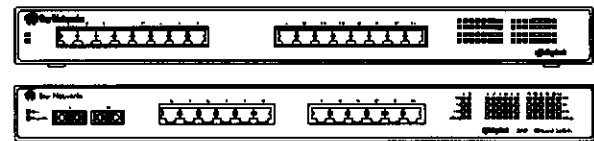

Figure 1: BayStack 350 Ethernet Switches: Model 350T (top) and Model 350F (bottom).

Key Product Features and Highlights

- Provides 14 or 16 switched autosense, auto-negotiating ports that operate in either 10BASE-T or 100 BASE-TX mode.
- The Model 350T switch provides 16 10/100 Mbps autosense switched ports.
- The Model 350F switch provides 2 switched 100BASE-FX ports for downlinks to network or data centers in addition to 12 10/100 Mbps autosense switched ports.
- Each port supports full-duplex (high-speed connections to servers or backbone switches) or half-duplex (connections to legacy NICs and hubs) operation to the connected device.

- 1.2 Gigabit per second switching fabric and custom switching ASICs support full wire speed forwarding rates on all ports.

- Priority Queuing supports prioritization of multimedia or latency-sensitive traffic, enabling integration of voice, video and data within the same network. This feature supports packet prioritization based on source address or conversation (source/destination address pair).

- Concurrent RMON allows full switch management with 4 groups of RMON (Alarms, Events, History, and Statistics) on every port.

- Supports creation of up to 32 policy-based VLANs that can be flexibly configured across the switch or on each port to be based on incoming port or station MAC address.

- Offers full 802.1D-compliant MAC Layer frame forwarding and filtering across all ports at the peak rate of 1.6 million packets per second.

- Supports a maximum of 8,192 MAC addresses per switch for deployment in small to large enterprise networks.

- Includes IEEE 802.1D-compliant Spanning Tree Protocol (STP) support for redundant network design.

- Protects against broadcast or multicast storms with adjustable rate limits.

- Port mirroring allows any level of switched traffic analysis using Bay Networks StackProbes or other external LAN analyzers.

- Password-protected Telnet support for in-band switch configuration and management.

- Includes Flash memory for nonvolatile storage of switching software image and system configuration information.

- BootP and TFTP support allows centralized switch IP address assignment, software upgrades, and SNMP agent updates over the network.

- Offers SNMP support for Ethernet MIB (RFC 1643), MIB II (RFC 1213), Bridge MIB (RFC 1493), RMON MIB (RFC 1757 and Bay Networks' private MIB extensions including Multi-Layer Topology™.

- Optivity Enterprise 7.2, Optivity Campus 6.2 and EZ LAN 3.3 network management support.

- Front panel LEDs provide real-time system and port status at a glance.

- Shielded RJ-45 connectors support MDI-X wiring on all ports.

- Slim one rack unit (RU) form factor minimizes use of rack space.

BayStack 350 Ethernet Switch Applications

Introduction

With the advent of corporate internets and intranets, new networked groupware applications, high-power desktop PCs, and the desire to integrate voice, video, and data on the same network, the demand for bandwidth is rapidly increasing. Fast Ethernet, as a simple order of magnitude increase in bandwidth, has proven to be a timely technology that addresses some of these bandwidth issues.

With the rapid decrease in price of Fast Ethernet NICs, as compared to legacy Ethernet NICs, most new workstations are being fitted with NICs that are capable of running at both Ethernet (10 Mbps) and Fast Ethernet (100 Mbps) speeds in anticipation of upgrades to higher-speed network infrastructures. Not all users will need the full 100 Mbps capacity of Fast Ethernet, but they are likely to need more than 10 Mbps in the near future.

The BayStack 350 switches are the first products that bring this dramatic increase in speed to enterprise networks at a breakthrough price. With their high-end features, the switches are designed to fit in the most demanding workgroup closets while also providing a cost-effective desktop solution. The advanced autosense technology delivers seamless co-existence of Ethernet and Fast Ethernet devices, and provides a smooth migration path to Fast Ethernet.

Segment and Desktop Switching Applications

The BayStack 350 is a hybrid segment and desktop switch that is used to connect users on 10 Mbps and 100 Mbps shared media hub segments to high-speed local servers running either Ethernet or Fast Ethernet NICs, and to link data centers via fiber optic cable for connectivity to centralized servers. Its 1.2 Gbps switching fabric and 1.6 million pps

forwarding capability future-proofs workgroup networks against a "meltdown" caused by a lack of overall bandwidth.

As desktop users migrate to Fast Ethernet, Bay Networks provides the choice of using a dedicated 100 Mbps desktop connection to a BayStack 350 switch for maximum performance, or using a shared 100 Mbps segment connection that still offers high performance at a lower total cost. In the latter scenario, the BayStack 100BASE-T shared media hub provides an excellent solution when used with the BayStack 350 switch for concentration of traffic.

Because every port on the switch incorporates Bay Networks autosense switching technology, the limit of two high-speed ports per switch no longer exists. Autosense on each port eliminates the high expenses incurred when network managers are forced to purchase additional switches after the two high-speed ports on have been allocated.

The BayStack 350 switch's VLAN capabilities allow adds, moves and changes to be easily accomplished, and also provide a measure of security by limiting broadcast domains. Traffic in different segments and subnets can be separated for maximum throughput and secure networking.
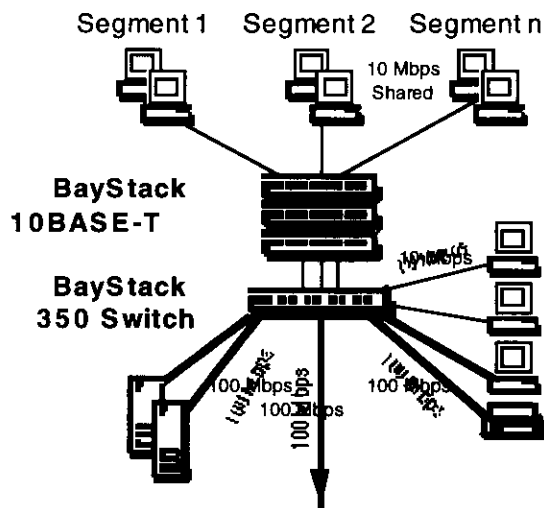

Figure 2 : BayStack 350 10/100 Autosense Switch for hybrid desktop and segment switching in the workgroup environment.

Server Cluster Application

Many companies have moved to centralized server farms and clusters for ease of

management, data security and cost savings. The BayStack 350 switches provide an excellent low-latency, high-throughput solution as an aggregation point for server clusters.

Full-duplex Fast Ethernet connections to the servers minimize server access time, maximizing throughput by providing a bi-directional, collision-free link to servers from the network.

The BayStack 350 switches provide multiple VLANs on each port, allowing a server to reside on multiple VLANs while separating the client-side broadcast domains.

Servers with video or other delay-sensitive traffic can use the BayStack 350 Priority Queuing feature to ensure minimal delay and timely delivery of data and video to the desktop.
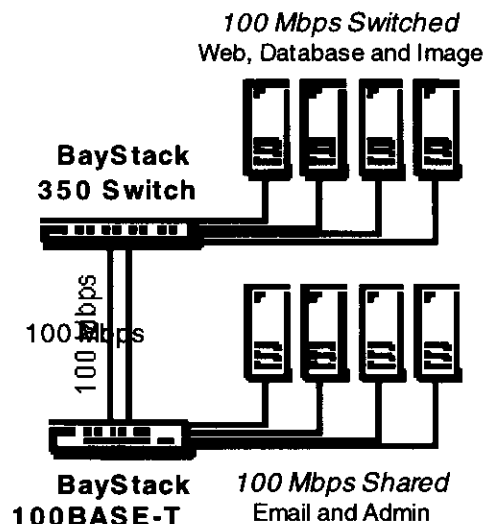

Figure 2 : BayStack 350 10/100 Autosense Switch Server Cluster Application.

BayStack 350 Ethernet Switch Features

The BayStack 350 Ethernet Switches provide a high-performance, multimedia ready, feature-rich, yet simple and practical solution that dramatically improves network performance at an affordable cost. At the same time, it offers a future-proof answer to ever-increasing demands for bandwidth and quality of service.

Requiring only a small incremental investment over 10 Mbps switches, administrators can

afford to deploy these cost-effective switches in today's 10 Mbps networks, ensuring optimal connectivity to high-speed servers and data center switches. Fast Ethernet workstations, servers, and shared media hubs can then be gradually brought online with no administrative involvement, because the switches autosense the speed and transmission mode of each connection automatically. The BayStack 350 feature set has been selected to enable quick deployment in small- to medium-size networks where "plug, play, and forget" is the operational mode.

The BayStack 350 switches also support demanding networking environments requiring sophisticated feature sets which, up to now, have only been available on more expensive high-end switches.

The following sections offer further discussions on many of these key features.

Autosense Port Technology

To allow any mix of 10 Mbps and 100 Mbps connections to the switch, autosense port technology uses IEEE 802.3u autonegotiation to automatically detect the speed of the attached device and distinguish full- or half-duplex transmission modes. As a result, each port adapts to one of the following four speeds and modes:

-10 BASE-T half-duplex

-10 BASE-T full-duplex

-100 BASE-TX half-duplex

-100 BASE-TX full-duplex

Switch Performance

1.2 Gigabit per second switching along with custom Application Specific Integrated Circuits (ASICs) offers full line rate service on all ports.

The BayStack 350 switch support 8,192 MAC addresses in its forwarding database, and learns addresses and forwards packets at the peak rate of 1.6 million packets per second.

This high-performance switch facilitates the creation of smoothly operating, congestion-free networks. Bandwidth hungry applications are easily supported, and the switch delivers a cost-per-port that represents a breakthrough in the networking industry.

Priority Queuing

The integration of voice, data and video onto the same network increases the demand for low latency and high throughput, requiring switches to provide certain packets with high priority for fast forwarding.

BayStack 350 switches have two output queues on each port: high priority and normal priority. Packets are assigned to a particular queue based on:

• Source MAC address (SA) of the station that generated the packet, thereby giving certain workstation traffic priority over others; or

• Source/Destination MAC address (SA/DA) pair, thereby increasing the granularity down to conversations between a client and server, or between two workstations.

This feature will be made available in an upcoming release of the BayStack 350 switch software.

Virtual LAN (VLAN) Support

VLANs are extended broadcast domains formed by bridging groups of switch ports. BayStack 350 switches enable VLAN assignments to be based on the incoming switch port or a station's MAC address. Port-based VLANs allow LAN segments to be extended and easily mapped to the subnets, while MAC-based VLANs increase granularity and allow workstations on the same segment to belong to different VLANs.

The initial release of the BayStack 350 switch software supports 8 port-based VLANs. Subsequent software releases will provide 32 MAC address-based VLANs in conjunction with 1024 configurable policies. Each policy can define any combination of 32 VLANs to which a MAC address can belong.

Concurrent RMON on Every Port

Bay Networks shared media hubs and the industry-leading Optivity applications provide network administrators with a wealth of management information and tools. The BayStack 350 switch extends this support by providing concurrent RMON on each port at no extra cost. Use of this standards-based management information enables standards-based RMON managers and Optivity applications to manage the network as well as the device. The BayStack 350 switches support four groups of RMON (Alarms, Events, History, and Statistics) on each port.

Port Mirroring

Many networks that implement baseline and monitoring techniques for network management

require attachment of a non-intrusive LAN analyzer or RMON probe onto each network segment. As the network is divided into multiple segments, roving the analyzer from segment to segment can become a cumbersome task. The solution is to connect all of these segments to the BayStack 350 switch, and then monitor them via the switch's port mirroring feature.

Port mirroring is a traffic duplication function that replicates all, or a subset, of the network traffic from a particular switch port onto a specific "mirror" port to which an analyzer or RMON probe can be attached. And because of the switch's autosense capability, both 10 Mbps and Fast Ethernet analyzers are supported. Any switch port can be used as a mirror port without impacting the operation of the switch.

The re-assignment of ports to be mirrored is accomplished through software, either locally or remotely. This feature will be available in a subsequent release of the BayStack 350 switch software.

Spanning Tree Protocol

The BayStack 350 Ethernet Switches support the Spanning Tree Protocol (STP) as specified in the ANSI/IEEE 802.1D (ISO/IEC 10038) Media Access Control Bridges standard. STP is implemented to detect and eliminate logical loops in a Layer 2 bridged or switched network. When multiple paths exist, the Spanning Tree algorithm automatically configures the network and places some of the bridge ports on standby to form a network with the most efficient traffic paths, avoiding the continual looping of frames. If a path fails, the protocol reconfigures the network to activate standby ports and bring up redundant paths to maintain network operations. The Spanning Tree Protocol is disabled by default.

Software Downloading

Although the BayStack 350 Ethernet Switches are fully tested to ensure stability, there may be instances where the device requires software upgrades for enhanced functionality, or to replace a software image that has been corrupted in Flash memory. Switches can use either console configuration or BootP to download the new image via the TFTP protocol.

Port Connectors

All RJ-45 connectors for the 10BASE-T and 100BASE-TX ports are wired for MDI-X. This means that straight-through unshielded twisted pair (UTP) cables can be used to provide switch connections to servers, desktops, and internetworking devices. For connection to devices configured with MDI-X ports, a crossover cable must be used. Detailed cable wiring diagrams are provided in the BayStack 350 switch User Manual for cable plant planning purposes.

BayStack 350 Ethernet Switch System Management and User Interface

The BayStack 350 Ethernet Switches can be configured and managed by three different options: console interface, Telnet, and any SNMP-compatible application such as the Bay Networks Optivity network management system. The following sections describes and contrasts the three configuration and management options.

Console Interface

The out-of-band Console Interface is supported through a 9-pin RS232-D console port on the BayStack 350 Ethernet Switch. The physical connector for the console port is a DB-9 male connector that operates on transmit, receive, and ground, with no handshaking signals required. Any VT-100 terminal or PC running terminal emulation is able to access this menu-driven interface. The interface provides complete configuration and management of the BayStack 350 switch.

Telnet Interface

In-band configuration and management of the BayStack 350 switch is supported through Telnet. Once an IP address has been configured for the switch through the console interface, a user can Telnet into the switch to facilitate day-to-day operations. The same menu-driven screens as the console interface are used. Although console and up to four Telnet sessions can take place at the same time, only one user can change the configuration of the switch at a given time.

SNMP and Optivity Network Management System Interface

SNMP is supported by the BayStack 350 Ethernet Switch through implementation of industry-standard Ethernet MIB (RFC 1398), MIB II (RFC 1213), Bridge MIB (RFC 1493), RMON MIB (RFC 1757) and Bay Networks private MIB extensions. Upcoming software releases will extend this support to Bay's Multi-Layer Topology MIB. SNMP implementation of the BayStack 350 switch supports public and private community strings, and up to four trap destinations.

Although SNMP is supported for all industry-leading UNIX- and Windows-based SNMP application platforms (such as HP OpenView), private MIB extensions implemented on the BayStack 350 enables the switch to be managed as part of a total network by the Bay Networks Optivity Enterprise and Optivity Campus management applications. System-level applications supported by Optivity include Expanded View™, Sphere Autotopology™, Network Atlas™, and OmniView™.

BayStack 350 Ethernet Switch Technical Specifications

Performance Specifications (64 byte packets)
Aggregate Throughput: 1.6 million packets per second (pps)
Switched 10 Mbps Port Forwarding Rate: 14,880 pps
Switched 100 Mbps Port Forwarding Rate: 148,810 pps
Latency: 10 microseconds for minimum packet length at 100 Mbps

Network Protocol and Standards Compatibility
IEEE 802.3 CSMA/CD (ISO/IEC 8802-3)
IEEE 802.3i 10BASE-T (ISO/IEC 8802-3)
IEEE 802.3u 100BASE-T (ISO/IEC 8802-3)
IEEE 802.1D MAC Bridges (ISO/IEC 10038)

Data Rate and Encoding
10 Mbps Manchester encoding
100 Mbps 4B/5B encoding

Microprocessor
Motorola MC68306

Memory
Processor DRAM: 1 MB
Flash Memory: 512 KB

Electrical Specifications
Line Frequency: 47 to 65 Hz
Volt Amperes Rating:
Input Power: 135 VA-80W
Input Voltage: 100 - 240 VAC
Input Current: 1.4A - .6A
Thermal Rating: 273BTU/hr

Physical Dimensions
(H) 1.75 in. x (W) 17.5 in. x (D) 12.5 in.
(H) 4.5 cm x (W) 44.2 cm x (D) 31.7 cm

Weight
10.0 lb. (4.54 kg)

Environmental Specifications
Operating Temperature: 5° to 40° C

Storage Temperature: -25° to 70° C
Operating Humidity: 85% maximum
  relative humidity, non-condensing
Storage Humidity: 95% maximum relative
  humidity, non-condensing
Operating Altitude: 10,000 ft (3,000 m)
  maximum
Storage Altitude: 10,000 ft (3,000 m)
  maximum
Free Fall/Drop: ISO 4180-s, NSTA 1A
Vibration: IEC 68-2-6/34
Shock/Bump: IEC 68-2-27-29

Electromagnetic Emissions
  Meets requirements of:
    FCC Part 15, Subpart B, Class A
    EN 55 022 (CISPR 22:1985), Class A
    VCCI Class 1 ITE
    CE Mark
Electromagnetic Susceptibility
  Electrostatic Discharge (ESD): EC 801-2,
    Level 2
  Radiated Electromagnetic Field: EC 801-3,
    Level 1
  Electrical Fast Transient/Burst: EC 801-4,
    Level 2

Safety Agency Approvals
  UL Listed (UL 1950)
  CSA 22.2 #950 with D3 deviations
  CSA Certified (CSA 22.2 #950, IEC950)
  IEC 950/EN 60 950 (TUV)
  TUV Licensed (EN 60 950)
  UL-94-V1 flammability requirements for all
    PC boards

Questions and Answers

Following are frequently asked questions regarding the BayStack 350 Ethernet Switch.

Will BayStack 350 switches offer fiber links?

Yes. The Model 350F switch, available mid-year, provides two 100BASE-FX half- or full-duplex downlink ports for connection to data center switches and routers via fiber.

How is the BayStack 350 switch positioned against other BayStack switches, such as the BayStack 28115/ADV and BayStack 28200?

The BayStack 350 switches are best-suited for desktop and segment switching applications in workgroup environments at the wiring closet level. They also fit at data centers in the server cluster application. The BayStack 28115/ADV with its 400 Mbps expansion port capability and 2 Gbps switching fabric is well-suited for network center applications where multiple, interconnected switches are required in order to provide the required port density. In this application, the BayStack 28115/ADV is most cost-effective when aggregating 100 Mbps connections, while the BayStack 28200 is most cost-effective when aggregating 10 Mbps connections. Account teams will want to lead with the new BayStack 350 because of its breakthrough price/performance.

Is the BayStack 350 Spanning Tree Protocol implementation compatible with the LattisSpan™ feature found in the BayStack 28000 series products? How can I introduce BayStack 350 switches into a network with existing BayStack 28000 switches?

LattisSpan was created to allow the creation of large switched networks without requiring extended configuration. As switched networks evolve with the addition of new devices, interoperability for redundant network design is a key concern. The standards-based IEEE 802.1D Spanning Tree Protocol (STP) can be used to provide the link between all Layer 2 switches in the network. Version 2.0 of the BayStack 28000 switch software provides STP support and is fully interoperable with the BayStack 350 STP implementation.

BayStack 350 Ethernet Switch Ordering and Availability Information

Bay Networks will be accepting orders for the Model 350T switch in late March 1997. Volume shipments will begin later in April 1997. Model 350F switch orders will be accepted in May 1997 and volume shipment will begin later in June 1997.

Order Number	Description	U.S. List Price
AL2012X01*	BayStack Model 350T Ethernet Switch with 16 Autosense 10BASE-T / 100BASE-TX ports	$3995.00
AL2012X02*	BayStack Model 350F Ethernet Switch with 14 Autosense 10BASE-T / 100BASE-TX ports and 2 100BASE-FX ports	$4995.00

* The seventh character (X)of the switch order number MUST be replaced with the proper code to indicate desired product nationalization:

- "A" - No power cord included.
- "B" - European "Schuko" power cord common in Austria, Belgium, Finland, France, Germany, The Netherlands, Norway and Sweden.
- "C" - Power cord commonly used in the United Kingdom and Ireland.
- "D" - Power cord commonly used in Japan.
- "E" - North American power cord.
- "F" - Australian power cord, also commonly used in New Zealand and the People's Republic of China.

Warranty Information

Bay Networks provides a one-year warranty for hardware from date of delivery to the end-user. Warranty service is provided under a "return to factory" repair or exchange program and can be obtained by calling your local product reseller or by contacting Bay Networks directly.

Service and Support

Bay Networks provides a wide range of support services under the Bay Networks

Service program. Included in these offerings are telephone support, installation, parts exchange, software maintenance and a host of other contract maintenance and consulting programs. Please contact your local product reseller or Bay Networks for more details on these support programs. To contact the Bay Networks service sales desk, please call (508) 436-8880.

Technical Assistance for Installed Products

Support for installed Bay Networks products is available from your local product reseller or through the Bay Networks Technical Response Center (TRC) Contract Hotline. The TRC contract hotline can be reached in the U.S. and Canada by calling 800-473-4911, in Europe by calling 011-33-92-966-968, in Asia Pacific by calling 011-61-2-9927-8800, and for the rest of the world by calling (408) 764-1000.

Technical information is available using the InfoFACTS fax-on-demand system in the U.S. and Canada by calling (800) 786-3228 and internationally by calling (408) 764-1002. Technical information can also be found in the Bay Networks forum on CompuServe or on the Bay Networks Worldwide Web home page at http://www.baynetworks.com.

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