

# Cisco 12000 Series Four-Port OC-12c/STM-4c **ATM ISE** Line Card

**The Cisco 12000 Series Four-Port OC-12/STM-4 ATM ISE Line Card revolutionizes the delivery of carrier edge services by combining an extensive set of service-enabling edge features with advanced ATM traffic management and sophisticated IP-to-ATM quality-of-service (QoS) functions, without compromising line-rate performance.**

### Product Overview

Service providers face the challenge of meeting customer demand for wire-speed Internet access using ATM while managing end-to-end QoS. The Cisco 12000 Series Four-Port OC-12/STM-4 ATM ISE Line Card (4-Port OC12/STM-4 ATM ISE), (Figure 1) expands the connectivity options for Cisco 12000 Series routers so that a service provider can attach a Cisco 12000 Series router directly to its existing ATM infrastructure. The line card supports advanced ATM traffic management features such as per virtual-circuit (VC) and per virtual-path (VP) traffic shaping, per-VC Weighted Random Early Detection (WRED), and per-VC Modified Deficit Round Robin (MDRR), including Low-Latency Queuing (LLQ). Constant bit rate (CBR), variable bit rate real-time (VBR-rt), variable bit rate non-real-time (VBR-nrt), and unspecified bit rate (UBR)

ATM service classes are supported. The segmentation and reassembly (SAR) of IP packets is performed in accordance with RFC 1483, Multiprotocol Encapsulation over ATM Adaptation Layer 5 (AAL5), taking advantage of the latest generation of the industry's programmable traffic management engine.

The line card features the Cisco 12000 Series IP Services Engine (ISE), which is a powerful adaptive network processor (ANP) that combines the hardware performance of application-specific integrated circuits (ASICs) with the flexibility of software to deliver multiple robust network-edge features while maintaining predictable line-rate performance.

Combined, the Cisco 12000 Series and ISE uniquely offer the advantages of a distributed architecture to 10G-enable the high-speed service provider edge by delivering linear performance scalability, a complete range of chassis form factors, application-optimized line cards, and 10-Gbps uplinks. It offers the industry's only per-customer, guaranteed priority

**Figure 1**

The Cisco 12000 Series  
4-Port OC-12/STM-4  
ATM ISE Line Card





packet delivery for the edge by providing thousands of queues that can be dynamically assigned per port, input and output filters per port, and the most comprehensive set of QoS features available, including packet classification, congestion avoidance, and LLQ.

## Applications

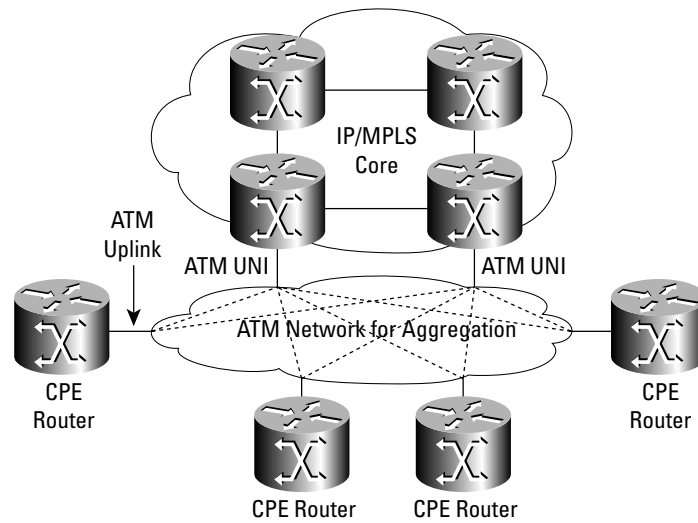
Cisco 12000 Series ATM line cards enable the integration of ATM networks with advanced IP backbones in many ways. The following examples show how service providers can use the ATM line cards for the Cisco 12000 Series to support advances in Internet technologies.

### Application 1—ATM WAN Connectivity

Using Cisco 12000 Series ATM line cards, service providers can offer Internet connectivity to enterprise customers through an ATM network (Figure 2).

**Figure 2**

ATM Network for WAN Services

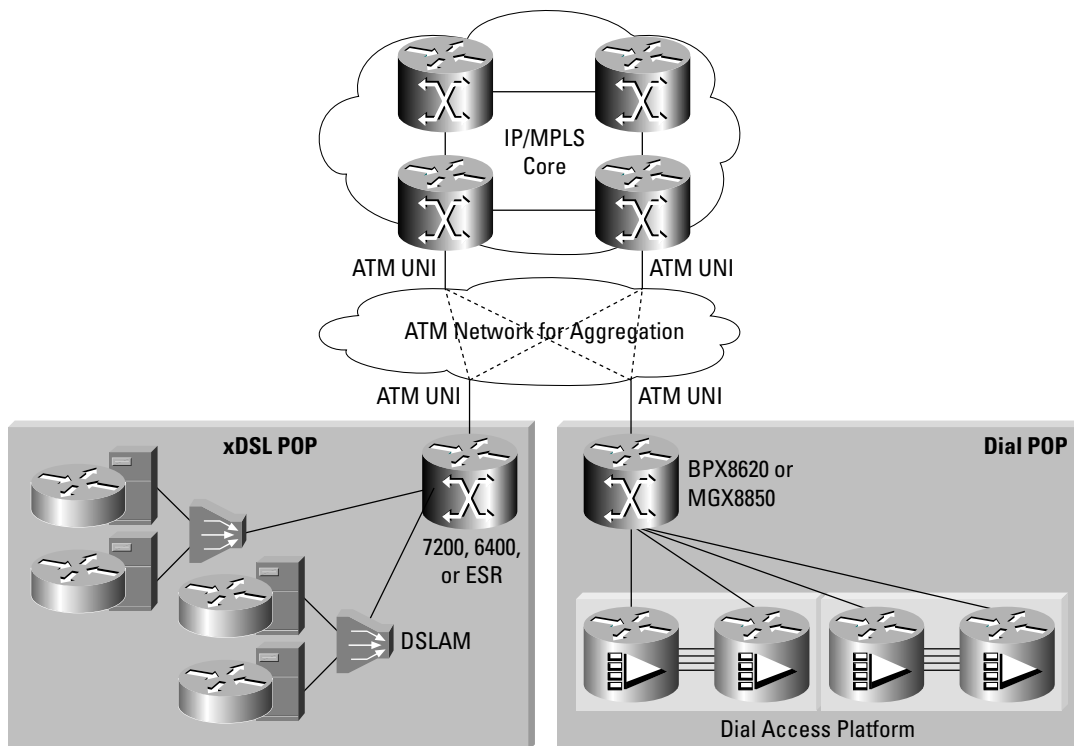




### Application 2—Low-Speed Access Aggregation

Using Cisco 12000 Series ATM line cards, service providers can provide digital subscriber line (DSL)-based access or dial-access services over an IP/Multiprotocol Label Switching (MPLS) core network (Figure 3).

**Figure 3**  
Low-Speed Access Aggregation

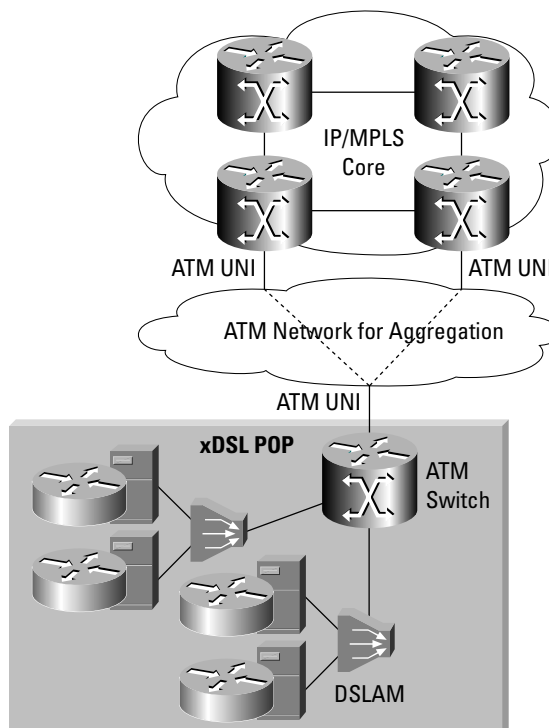




### Application 3—Business DSL Aggregation

Service providers can provide non-session-based (non-PPP) DSL Internet access for business customers who want to connect to their Internet backbones through the Cisco 12000 Series router ATM line cards (Figure 4).

**Figure 4**  
ATM Network for DSL Aggregation



#### Features and Benefits

- *Per-VC and per-VP Traffic Shaping*—Traffic shaping is a function typically provided on ATM edge devices to ensure that bursty traffic conforms to a predetermined “contract.” To implement traffic shaping, the Cisco 12000 Series 4-Port OC-12/STM-4 ATM ISE Line Card supports per-VC and per-VP shaping, including industry-leading minimum 1-Kbps granularity, allowing flexibility and control over every VC and VP configured.
- *IP QoS Features*—The line card supports per-VC IP QoS features that allow customers to apply advanced-queuing and bandwidth-management functions such as WRED and MDRR, including LLQ to individual virtual circuits to avoid congestion and delay. In addition, extended access control lists (ACLs) and committed access rate (CAR) are supported on a per-VC basis on both ingress and egress.
- *IP/MPLS to ATM QoS Mapping*—Also supported is IP to ATM QoS setting via Cell Loss Priority (CLP) bit support and VC bundling which allows customers to divide traffic on different VCs depending on the desired class of service (CoS).



- *Any Transport over MPLS (AToM)*—MPLS is the primary technology for ATM/IP convergence, and the 4-port OC-12/STM-4 ATM line card allows the transport of Layer 2 traffic across an MPLS network. AToM will allow a migration path toward the consolidation of IP and ATM networks while protecting existing equipment investment and it will accommodate the scaling of existing services using MPLS. All ATM operation, administration, and maintenance (OAM) functions will be transported transparently through the MPLS network and will guarantee all QoS services provided to customers.
- *Modular Quality of Service Command-Line Interface (Modular QoS CLI)*—For simplicity, QoS features are configurable with the user-friendly Modular QoS CLI developed by Cisco.

### Product Specifications

Table 1 provides technical specifications, and Table 2 provides part numbers for ordering.

**Table 1** Product Specifications

<b>Chassis Compatibility</b>	<ul style="list-style-type: none"> <li>• All Cisco 12000 Series chassis; no slot dependency</li> </ul>
<b>Software Compatibility</b>	<ul style="list-style-type: none"> <li>• Cisco IOS® Software Release 12.0(25)S or later</li> </ul>
<b>Protocols</b>	<ul style="list-style-type: none"> <li>• Classical IP over ATM; Client and Address Resolution Protocol (ARP) Server (RFC1577, RFC1755, and RFC1626)</li> <li>• Multiprotocol Encapsulation over AAL5 (RFC1483) with support for LLC/SNAP, IP Mux, and NLPID encapsulation</li> <li>• UNI 3.0/3.1 (including Integrated Local Management Interface [ILMI])</li> <li>• F4 and F5 OAM Alarm Indication Signal (AIS) and Remote Defect Indicator (RDI) alarms and loopback</li> <li>• Default IP MTU for use over ATM AAL5 (RFC1626)</li> <li>• ATM Signaling Support for IP over ATM (RFC1755)</li> <li>• CBR, VBR-rt, VBR-nrt, and UBR ATM service classes</li> </ul>
<b>Port Density</b>	<ul style="list-style-type: none"> <li>• 4 OC-12/STM-4 interfaces per line card, per chassis slot</li> <li>15 slots (Cisco 12416 and 12016 routers)—60 OC-12c/STM-4c ports</li> <li>10 slots (Cisco 12012 router)—20 OC-12c/STM-4c ports</li> <li>9 slots (Cisco 12410 router)—36 OC-12c/STM-4c ports</li> <li>6 slots (Cisco 12008 router)—12 OC-12c/STM-4c ports</li> <li>5 slots (Cisco 12406 router)—20 OC-12c/STM-4c ports</li> <li>3 slots (Cisco 12404 router)—12 OC-12c/STM-4c ports</li> </ul>
<b>Connectivity</b>	<ul style="list-style-type: none"> <li>• 4 OC-12/STM-4 Single Mode, Intermediate Reach SC connectors</li> <li>• 4 OC-12/STM-4 Multimode, Short Reach SC connectors</li> </ul>



**Table 1** Product Specifications

<b>Optical Specifications</b>	Single Mode, Intermediate Reach (IR) <ul style="list-style-type: none"><li>• Connector type: SC</li><li>• Wavelength: 1310 nm</li><li>• Fiber type: SMF</li><li>• Core size: 9/125 <math>\mu\text{m}</math></li><li>• Cable distance: 15 km</li><li>• Transmit power: <math>-15</math> to <math>-8</math> dBm</li><li>• Receive power: <math>-28</math> to <math>-8</math> dBm</li></ul> Multimode, Short Reach (SR) <ul style="list-style-type: none"><li>• Connector type: SC</li><li>• Wavelength: 1310 nm</li><li>• Fiber type: MMF</li><li>• Core sizes: 62.5/125 <math>\mu\text{m}</math></li><li>• Cable distance: 2 km</li><li>• Transmit power: <math>-20</math> to <math>-14</math> dBm</li><li>• Receive power: <math>-26</math> to <math>-14</math> dBm</li></ul>
<b>Features and Functions</b>	ATM layer <ul style="list-style-type: none"><li>• Support for up to 2048 virtual circuits per port<sup>1</sup></li><li>• Support for up to 8 CoS queues per VC, including one LLQ per VC</li><li>• 16 VCI bits (0–64K) and 8 VPI bits (0–255) over any VPI/VCI combination within the full range</li><li>• Support for up to 255 VPs per port</li><li>• SVC signaling (point-to-point connections)</li><li>• SVC signaling (point-to-multipoint connections)</li><li>• UNI 3.0/3.1 (including ILMI)</li><li>• Multiprotocol Encapsulation over AAL5</li><li>• Classical IP over ATM; Client and ARP Server</li></ul> Traffic management <ul style="list-style-type: none"><li>• CBR</li><li>• VBR-rt, VBR-nrt</li><li>• UBR (including optional PCR)</li><li>• Traffic shaping on a per-VC /VP basis (shaping granularity: minimum of 1 Kbps, compliant with I.371 granularity definition)</li><li>• Per-VC queuing/buffering</li><li>• Configurable queue depth</li><li>• Per-VC WRED</li><li>• Per-VC MDRR, including LLQ</li><li>• CLP bit setting</li><li>• VC bundling</li></ul> OAM <ul style="list-style-type: none"><li>• F4 and F5 OAM</li><li>• AIS/RDI alarms and loopback cell</li></ul>

1. Subject to overall configuration



**Table 1** Product Specifications

<b>Features and Functions (Continued)</b>	Packet layer <ul style="list-style-type: none"> <li>• IP version 4 (IPv4)</li> <li>• IP version 6 (IPv6)</li> <li>• IP Multicast Forwarding</li> <li>• MTU of 9180 bytes</li> <li>• Basic MPLS switching</li> <li>• MPLS CoS</li> <li>• MPLS/VPN PE functionality</li> <li>• MPLS VPN: Carrier Supporting Carrier (CsC) with IPv4 BGP-label distribution</li> <li>• MPLS VPN: Inter Provider VPN (Inter-AS) with IPv4 BGP-label distribution</li> <li>• MPLS TE</li> <li>• CAR</li> <li>• NetFlow version 5 (sampled) and version 8 (aggregated)</li> </ul>
<b>Security</b>	<ul style="list-style-type: none"> <li>• Extended ACLs (filtering) per virtual circuit</li> <li>• uRPF—Unicast Reverse Path Forwarding (anti-spoofing checks)</li> <li>• NetFlow v5 (DOS tracking)</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>• 512 MB route memory (default, no options)</li> <li>• 512 MB packet memory (default, no options)</li> </ul>
<b>Performance</b>	<ul style="list-style-type: none"> <li>• 2.8 Mpps aggregated line rate for 64-byte packets</li> </ul>
<b>Environmental Conditions</b>	Temperature <ul style="list-style-type: none"> <li>• Operating: 32 to 104°F (0 to 40°C)</li> <li>• Storage: -4 to 149°F (-20 to 65°C)</li> </ul> Humidity <ul style="list-style-type: none"> <li>• Operating (noncondensing): 10 to 90%</li> <li>• Storage (noncondensing): 5 to 95%</li> </ul>
<b>Reliability and Availability</b>	<ul style="list-style-type: none"> <li>• Non-service affecting online insertion and removal (OIR)</li> <li>• Route Processor Redundancy Plus (RPR+)</li> <li>• Nonstop Forwarding (NSF)/Stateful Switch Over (SSO)</li> </ul>
<b>Network Management</b>	<ul style="list-style-type: none"> <li>• Modular Quality-of-Service (MQC) command-line interface (CLI)</li> <li>• Simple Network Management Protocol (SNMP)</li> <li>• Management Information Base (MIB)-II</li> <li>• Cisco 12000 Series Element Management System (EMS) v3.1 or later</li> <li>• ILMI MIB</li> <li>• MQC MIB</li> <li>• ATM MIB (RFC1695)</li> <li>• Cisco AAL5 MIB</li> <li>• Cisco ATM EXT MIB</li> <li>• IF MIB</li> <li>• SONET MIB (RFC 2558)</li> <li>• Cisco Internet Engineering Task Force (IETF) ATM2 PVCTRAP MIB</li> <li>• MPLS TE MIB</li> <li>• Cisco Queue MIB</li> </ul>



**Table 1** Product Specifications

<b>Physical Specifications</b>	<ul style="list-style-type: none"><li>• Weight: 11.4 lb (5.2 kg)</li><li>• Height: 14.5 in. (36.8 cm)</li><li>• Width (occupies wide slot): 1.75 in. (4.6 cm)</li><li>• Depth: 18.5 in. (45.7 cm)</li></ul>
<b>Power</b>	140 watts
<b>LEDs</b>	<ul style="list-style-type: none"><li>• Line Active LED</li><li>• Rx Carrier LED</li><li>• Rx Cells LED</li><li>• Alphanumeric management display</li></ul>
<b>Compliance and Agency Approvals</b>	<p>This product is designed to meet the following requirements (some qualifications in progress):</p> <p>SONET/SDH</p> <ul style="list-style-type: none"><li>• Telcordia (Bellcore GR-253 as applicable)</li><li>• ITU-T G.957 as applicable</li><li>• ITU-T G.958 as applicable</li></ul> <p>Safety</p> <ul style="list-style-type: none"><li>• UL 1950</li><li>• CSA 22.2-No. 950</li><li>• EN60950</li><li>• IEC 60950 CB Scheme</li><li>• ACA TS001</li><li>• AS/NZS 3260</li><li>• EN60825/IEC60825 laser safety</li><li>• FDA Code of Federal Regulations (USA) laser safety</li></ul> <p>Electromagnetic Interference (EMI)</p> <ul style="list-style-type: none"><li>• FCC CFR 47-PART 15 1998 Class A</li><li>• ICES 003 Class A</li><li>• AS/NZS 3548 Class A</li><li>• EN55022 Class B (up to 1 GHz)</li><li>• VCCI Class A</li><li>• CISPR 22 Class B (up to 1 GHz)</li><li>• BSMI/CNS 13438:1997 Class A</li><li>• IEC-1000-3-2 Power Line Harmonics</li><li>• IEC-61000-3-3 Voltage Fluctuations and Flicker</li></ul> <p>Immunity</p> <ul style="list-style-type: none"><li>• IEC-1000-4-2 ESD (8kV contact, 15kV air)</li><li>• IEC-1000-4-3 Radiated immunity (10V/m)</li><li>• IEC-1000-4-4 EFT (2kV power port, 1kV signal port)</li><li>• IEC-1000-4-5 surge A/C port (4kV CM, 2kV DM)</li><li>• IEC-1000-4-5 Surge Signal port (2kV CM, 1kV DM)</li><li>• IEC-1000-4-5 Surge D/C port (0.5kV CM, 0.5kV DM)</li><li>• IEC-1000-4-6 Low Frequency Conductive Immunity (10V)</li><li>• IEC-1000-4-11 Voltage dips and sags</li><li>• EN55024/CISPR24 ITE Immunity</li></ul>



**Table 1** Product Specifications

<b>Compliance and Agency Approvals (Continued)</b>	Network Equipment Building Standards (NEBS) <ul style="list-style-type: none"><li>• SR-3580: NEBS criteria levels (Level 3 compliant)</li><li>• GR-63-Core: NEBS physical protection</li><li>• GR-1089-Core: NEBS EMC and safety</li></ul> European Telecommunications Standards Institute (ETSI) <ul style="list-style-type: none"><li>• EN 300 386/EN 300 386-2 Class B</li></ul>
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## Ordering Information

**Table 2** Part Numbers

Description	Part Number
Cisco 12000 Series 4-Port OC-12/STM-4 ATM ISE Single Mode Line Card	4OC12X/ATM-IR-SC
Cisco 12000 Series 4-Port OC-12/STM-4 ATM ISE Multimode Line Card	4OC12X/ATM-MM-SC

## Service and Support

Cisco Systems offers a wide range of service support offerings for its service provider customers. Cisco has earned the highest customer-satisfaction ratings in the industry by providing the world-class service and support necessary to deploy, operate, and optimize service provider networks. Whether the goal is speed to market, maximizing network availability, or enhancing customer satisfaction and retention, Cisco is committed to its service provider customers' success.

## For More Information

For more information about Cisco service and support programs and benefits, visit:

[www.cisco.com/public/Support\\_root.shtml](http://www.cisco.com/public/Support_root.shtml)

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