

Cisco 12000 Series Packet over SONET/SDH (POS) Line Cards

The Cisco® 12000 Series of packet over SONET/SDH (POS) line cards deliver state-of-the-art technology to cost-effectively scale carrier-class IP/Multiprotocol Label Switching (MPLS) packet infrastructures to meet the needs of service providers around the world (Figures 1 and 2). The POS interfaces deliver high-performance, powerful features and a full range of interface types, speeds, and connectors, enabling deployment of high-speed core, peering, and edge applications. The POS line cards provide the ideal solution to meet and exceed the ever-growing demands for higher capacity and service availability.

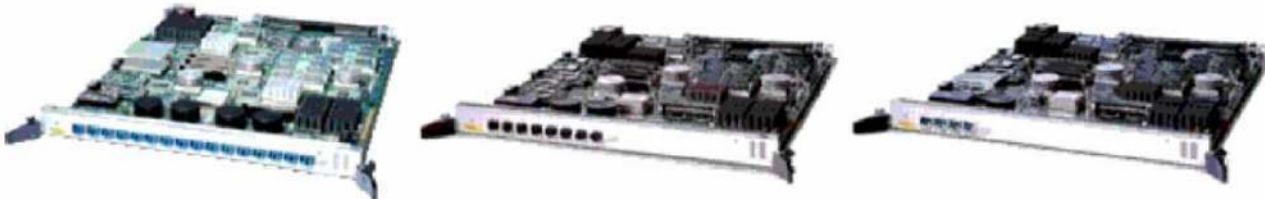
CISCO ISE POS INTERFACES—DELIVERING ROBUST HIGH-SPEED EDGE FUNCTIONS

Service providers face the challenge of meeting customer demand by building scalable, feature-rich networks that can deliver value-added services such as private IP connectivity; integrated data, voice, and video services; and tiered service offerings—at all interface rates without compromising density or line-rate performance. The Cisco IP Services Engine (ISE) line cards provide the same powerful feature set as the standard POS line cards and also accommodate service provider requirements by providing an extensive set of service-enabling edge features at line rate such as packet classification, congestion avoidance, and low-latency queuing (LLQ).

Figure 1. Cisco 12000 Series 1-Port OC-48c/STM-16c POS ISE Line Card



Figure 2. Cisco 12000 Series 16-, 8-, and 4-Port OC-3c/STM-1c POS ISE Line Cards



PRODUCT FEATURES

Table 1 describes the basic features on the Cisco 12000 Series POS line cards.

Table 1. Product Features

Feature	Description
Performance	<ul style="list-style-type: none"> Line-rate throughput for IP forwarding and MPLS switching Performance sustained in fully loaded system No performance drops as quality-of-service (QoS) or accounting features are enabled
Reliability and Availability	<ul style="list-style-type: none"> Online insertion and removal (OIR) enabling insertion and removal of line cards without affecting traffic Mean time between failure (MTBF) more than 80,000 hours
Network Management	<ul style="list-style-type: none"> Cisco IOS® Software command-line interface (CLI) Cisco 12000 Manager for configuration, fault, and performance element management Simple Network Management Protocol (SNMP) MIBs: <ul style="list-style-type: none"> SONET/SDH MIB (RFC 2558) MIB-II
Statistics and Accounting	<ul style="list-style-type: none"> Byte and packet counting per ingress port for IP and MPLS packets Byte and packet counting per ingress port for IP and MPLS type-of-service (ToS) bits Packet counting for Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) functions Packet and byte counting for committed-access-rate (CAR) feature Counting per ingress port for IP prefixes and Cisco Express Forwarding adjacencies
SONET/SDH Functions	<ul style="list-style-type: none"> Error counts for B1, B2, and B3 Threshold crossing alerts (TCAs), far end block error path (FEBE) for B1, B2, and B3 with threshold that can be set Loss of signal (LOS), loss of frame (LOF), line alarm indicator signal (LAIS), path alarm indicator signal (PAIS), loss of pointer (LOP), line remote defect indicator (LRDI), path remote defect indicator (PRDI), signal failure (SF), signal degrade (SD), line remote error indicator (line FEBE), and path remote error indicator (path FEBE) Performance monitoring: Error counts for B1, B2, and B3; TCAs; and FEBE for B1, B2, and B3 with threshold that can be set Synchronization <ul style="list-style-type: none"> Local (internal) or loop timed (recovered from network) Stratum 3 clock accuracy over full operating temperature Pointer activity monitoring Local (diagnostic) and line (network) loopback Payload mapping <ul style="list-style-type: none"> 1 + X⁴³ self-synchronous scrambler

PRODUCT SPECIFICATIONS

Table 2 provides specifications for the different Cisco 12000 Series POS line cards.

Table 2. Product Specifications

Line Card and Description	Forwarding Engine	Cisco IOS Software Release	Chassis Supported	Per-Chassis Port Densities	Per-Rack Port Densities
2-Port OC-192c POS 2-Port OC-192c/STM-64c POS	Engine 6	<ul style="list-style-type: none"> 12.0(27)S 	<ul style="list-style-type: none"> Cisco 12816 Cisco 12810 	<ul style="list-style-type: none"> 30 ports 18 ports 	<ul style="list-style-type: none"> 30 ports 36 ports
1-Port OC-192c POS ES 1-Port OC-192c/STM-64c POS ES	Engine 4+	<ul style="list-style-type: none"> 12.0(21)S 12.0(21)ST 	<ul style="list-style-type: none"> Cisco 12416 Cisco 12816 Cisco 12410 Cisco 12810 Cisco 12406 Cisco 12404 	<ul style="list-style-type: none"> 15 ports 15 ports 9 ports 9 ports 5 ports 3 ports 	<ul style="list-style-type: none"> 15 ports 15 ports 18 ports 18 ports 20 ports 24 ports
8-Port OC-48c POS 8-Port OC-48c/STM-16c POS	Engine 6	<ul style="list-style-type: none"> 12.0(27)S 	<ul style="list-style-type: none"> Cisco 12816 Cisco 12810 	<ul style="list-style-type: none"> 120 ports 72 ports 	<ul style="list-style-type: none"> 120 ports 144 ports
4-Port OC-48c POS ES 4-Port OC-48c/STM-16c POS ES	Engine 4+	<ul style="list-style-type: none"> 12.0(21)S 12.0(21)ST 	<ul style="list-style-type: none"> Cisco 12416 Cisco 12816 Cisco 12410 Cisco 12810 Cisco 12406 Cisco 12404 	<ul style="list-style-type: none"> 60 ports 60 ports 36 ports 36 ports 20 ports 12 ports 	<ul style="list-style-type: none"> 60 ports 60 ports 72 ports 72 ports 80 ports 96 ports
1-Port OC-48c POS ISE 1-Port OC-48c/STM-16c POS ISE	Engine 3	<ul style="list-style-type: none"> 12.0(21)S 12.0(21)ST 	<ul style="list-style-type: none"> Cisco 12x16 Cisco 12x10 Cisco 12x06 Cisco 12x04 	<ul style="list-style-type: none"> 15 ports 9 ports 5 ports 3 ports 	<ul style="list-style-type: none"> 15 ports 18 ports 20 ports 24 ports
4-Port OC-12c POS ISE 4-Port OC-12c/STM-4c POS ISE	Engine 3	<ul style="list-style-type: none"> 12.0(21)S 12.0(21)ST 	<ul style="list-style-type: none"> Cisco 12x16 Cisco 12x10 Cisco 12x06 Cisco 12x04 	<ul style="list-style-type: none"> 60 ports 36 ports 20 ports 12 ports 	<ul style="list-style-type: none"> 60 ports 72 ports 80 ports 96 ports
16-Port OC-3c POS ISE 16-Port OC-3c/STM-1c POS ISE	Engine 3	<ul style="list-style-type: none"> 12.0(21)S 12.0(21)ST 	<ul style="list-style-type: none"> Cisco 12x16 Cisco 12x10 Cisco 12x06 Cisco 12x04 	<ul style="list-style-type: none"> 240 ports 144 ports 80 ports 48 ports 	<ul style="list-style-type: none"> 240 ports 288 ports 320 ports 384 ports
8-Port OC-3c POS ISE 8-Port OC-3c/STM-1c POS ISE	Engine 3	<ul style="list-style-type: none"> 12.0(22)S 	<ul style="list-style-type: none"> Cisco 12x16 Cisco 12x10 Cisco 12x06 Cisco 12x04 	<ul style="list-style-type: none"> 120 ports 72 ports 40 ports 24 ports 	<ul style="list-style-type: none"> 120 ports 144 ports 160 ports 192 ports

Line Card and Description	Forwarding Engine	Cisco IOS Software Release	Chassis Supported	Per-Chassis Port Densities	Per-Rack Port Densities
4-Port OC-3c POS ISE 4-Port OC-3c/STM-1c POS ISE	Engine 3	• 12.0(22)S	• Cisco 12x16 • Cisco 12x10 • Cisco 12x06 • Cisco 12x04	• 60 ports • 36 ports • 20 ports • 12 ports	• 60 ports • 72 ports • 80 ports • 96 ports

PHYSICAL AND ELECTRICAL SPECIFICATIONS

Table 3 provides details about the physical and electrical specifications of the different Cisco 12000 Series POS line cards.

Table 3. Physical and Electrical Specifications

Line Card	Dimensions	Weight	Power	Route Memory (default and maximum)	LEDs
2-Port OC-192c POS	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	9.51 lb (4.32 kg)	174W Maximum	<ul style="list-style-type: none"> Default: 512 MB Maximum: 512 MB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
1-Port OC-192c POS ES	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	9.51 lb (4.32 kg)	174W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 512 MB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
8-Port OC-48c POS	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	9.51 lb (4.32 kg)	174W Maximum	<ul style="list-style-type: none"> Default: 512 MB Maximum: 512 MB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
4-Port OC-48c POS ES	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	10.21 lb (4.64 kg)	214W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 512 MB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
1-Port OC-48c POS ISE	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	6.0 lb (2.7 kg)	140W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 1 GB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display

Line Card	Dimensions	Weight	Power	Route Memory (default and maximum)	LEDs
4-Port OC-12c POS ISE	<ul style="list-style-type: none"> Height: 14 in. (35.6 cm) Depth: 18 in. (45.7 cm) 	6.0 lb (2.7 kg)	140W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 1 GB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
16-Port OC-3c POS ISE	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	6.0 lb (2.7 kg)	196W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 1 GB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
8-Port OC-3c POS ISE	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	6.0 lb (2.7 kg)	196W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 1 GB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display
4-Port OC-3c POS ISE	<ul style="list-style-type: none"> Height: 14.5 in. (36.5 cm) Depth: 18 in. (45.7 cm) 	6.0 lb (2.7 kg)	196W Maximum	<ul style="list-style-type: none"> Default: 256 MB Maximum: 1 GB 	<ul style="list-style-type: none"> Enable Receive carrier Receive packets Alphanumeric management display

OPTICAL SPECIFICATIONS

Table 4 provides details about the optical specifications of the different Cisco 12000 Series POS line cards.

Table 4. Optical Specifications

Line Card	Tx Power (dBm)	Power (dBm)	Rx Power (dBm)	Power (dBm)	Po (dB)	DSRmax (ps/nm)	Target Distance (km)**	Rx Wavelength (nm)	Tx Wavelength (nm)	Fiber Type***	Compliance****	
	P_{Tmax}	P_{Tmin}	P_{Rmax}	P_{Rmin}							Telcordia	ITU
OC-192											GR-253	G.691
OC-192 SR-1	-1	-6	-1	-11	1	6.6	2	1260-1600	1290-1330	G.652	SR-1	I-64.1
OC-192 IR	2	-1	-1	-14	2	800	40	1260-1600	1530-1565	G.652	IR-2	S-64.2b
OC-192 LR	7	4	-9	-22	2	1600	80	1260-1600	1530-1565-	G.652	Cisco LR	S-64.2b
OC-48											GR-253	G.957
OC-48/POS-SR-xx and OC-	-3	-10	-3	-18	1	12	2	1260-	1266-	G.652	SR-1	I-16

Line Card	Tx	Power	Rx	Power	Po (dB)	DSRmax ps/nm	Target Distance (km)**	Rx Wavelength (nm)	Tx Wavelength (nm)	Fiber Type***	Compliance****	
48/SRP-SR-SC								1600	1360			
OC-48/POS-1550-xx***** and OC-48/SRP-LR-SC	+3	-2	-9	-28	2	1600	80	1260-1600	1500-1580	G.652 G.654***	LR-2	L-16.2
OC-48 Pluggable Optic Modules												
POM-OC48-SR-LC	-3	-10	-3	-18	1	12	2	1260-1600	1266-1360	G.652	SR-1	I-16
POM-OC48-IR1-LC	0	-5	0	-18	1	-	15	1260-1600	1266-1360	G.652	IR-1	S-16.1
POM-OC48-LR2-LC	3	-2	-9	-28	2	1600	80	1260-1600	1500-1580	G.652	LR-2	L-16.2
OC-12											GR-253	G.957
OC-12/POS-MM***** and OC-12/SRP-MM*****	-14	-20	-14	-23	-	-	-	-	-	-	NA	NA
OC-12/POS-SM and OC-12/SRP-SM	-8	-15	-8	-28	1	46 (74)	15	1260-1600	1293-1334	G.652	IR-1	S-4.1
OC-3											GR-253	G.957
OC-3 POS-MM*****	-14	-20	-14	-23	1	-	-	-	-	-	NA	NA
OC-3 POS-SM	-8	-15	-8	-28	1	96	15	1260-1600	1261-1360	G.652	IR-1	S-1.1
OC-3 POS-LR	0	-5	-10	-34	1	246 (NA)	40	1260-1600	1263-1360	G.652	LR-1	L-1.1

* In some cases there are two different types of lasers with different spectral widths specified in one application code. Different spectral widths introduce different values of D_{SRmax} .

** Target distances are used for classification only and not for specification.

*** Either G.652 or G.654 fiber can be used for long-reach (LR) applications. G.654 has low fiber attenuation at 1550-nm wavelength.

**** Contact your Cisco account team for details about compliance level to these standards.

***** xx=SC or FC connectors

***** There are no Telcordia or ITU specifications for multimode SONET/SDH interfaces.

Note: Cisco 1-port OC-192c/STM-64c POS and DPT line cards with short reach (SR)-2 optics are compliant with GR-1337-CORE.

TELCORDIA AND ITU OPTICAL INTERFACE STANDARDS

Table 5 gives details about Telcordia and ITU interface standards.

Table 5. Telcordia and ITU Optical Interface Standards

Telcordia	SR-1		IR-2	SR-1	IR-1		IR-1	LR-1
ITU	I-64.1	LR	S-64.2b	I-16	LR-2 L-16.2	S-4.1	S-1.1	L-1.1
System	OC-192	OC-192	OC-192	OC-48	OC-48	OC-12	OC-3	OC-3
Transmitter	SLM (DFB)		SLM (DFB)	MLM (FP)	SLM (DFB)	MLM (FP)	MLM (FP)	MLM/SLM*
Tx Wavelength (nm)	1290–1330	1530-1565	1530–1565	1266–1360	1500–1580	1293–1334	1261–1360	1263–1360
Rx Wavelength (nm)	1260-1600	1260-1600	1260-1600	1260-1600	1260-1600	1260-1600	1260-1600	1260-1600
P_{Tmax} (dBm)	–1	7	2	–3	3	–8	–8	0
P_{Tmin} (dBm)	–6	4	–1	–10	–2	–15	–15	–5
Δλ_{rms} (nm)	–	–	–	4	–	4, (2.5)**	7.7	3/NA*
Δλ₂₀ (nm)	1	–	NA	–	<1	–	–	NA/1
Receiver								
P_{Rmax} (dBm)	–1	–9	–1	–3	–9	–8	–8	–10
P_{Rmin} (dBm)	–11	–22	–14	–18	–28	–28	–28	–34
Optical Path								
Target Distance (km)³	2	80	40	2	80	15	15	40
Path Penalty Po (dB)	1	2	2	1	2	1	1	1
Link Budget (dB)	4	24	11	8	26	13	13	29
D_{SRmax} (ps/nm)	6.6	1600	800	12	1600	46, (74)**	96	246/NA*
Fiber Type	G.652	G.652	G.652	G.652	G.652, G.654	G.652	G.652	G.652

* Both MLM and SLM lasers are specified. If the transmitter is an MLM laser, the specification for the MLM laser should be applied. If the transmitter is an SLM laser, the specification for the SLM laser should be applied.

** In OC-12, I-1, S-4.1, if maximum Δλ_{rms} of MLM laser •2.5nm, then the D_{SRmax}=74. If maximum Δλ_{rms} of MLM laser •4 nm and •2.5 nm, then the D_{SRmax}=46.

*** The target distances are to be used for classification only and not for specification.

ENVIRONMENTAL APPROVALS AND COMPLIANCE

Table 6 gives standards-compliance information for the Cisco 12000 Series POS line cards.

Table 6. Compliance and Agency Approvals

Feature	Description
Environmental	<ul style="list-style-type: none"> • Operating temperature: 32 to 104°F (0 to 40°C) • Storage temperature: –4 to 149°F (–20 to 65°C) • Relative humidity: <ul style="list-style-type: none"> – 10 to 90%, noncondensing, operating conditions – Up to 95%, noncondensing, nonoperating conditions
Safety	<ul style="list-style-type: none"> • UL/CSA/IEC/EN 60950-1 • AS/NZS 60950 • EN60825/IEC 60825 Laser Safety • FDA – Code of Federal Regulations (USA) Laser Safety
EMI	<ul style="list-style-type: none"> • FCC Part 15 Class A • ICES 003 Class A • AS/NZS Class A • CISPR 22 (insert Class A or Class B (up to 1 GHz)) • EN55022 (insert Class A or Class B (up to 1 GHz)) • VCCI Class A • BSMI Class A • IEC/EN61000-3-2 Power Line Harmonics • IEC/EN61000-3-3 Voltage Fluctuations and Flicker • Note 1: Group 1 systems meet CISPR/EN55022 Class B (up to 1 GHz). Group 2 systems meet CISPR/EN55022 Class A. Use Class B (up to 1 GHz) for line cards designed for use in Group 1 systems. New chassis not requiring Class B explicitly should use Class A. • Group 1: Cisco 12006, 12010, 12404, 12406, 12410, 12016, 12416, 12810, and 12816 • Group 2: Cisco 12008 and 12012
Immunity (Basic Standards)	<ul style="list-style-type: none"> • IEC/EN61000-4-2 Electrostatic Discharge Immunity (8-kV contact, 15-kV air) • IEC/EN61000-4-3 Radiated Immunity (10 V/m) • IEC/EN61000-4-4 Electrical Fast Transient Immunity (2-kV power, 1-kV signal) • IEC/EN61000-4-5 Surge AC Port (4-kV CM, 2-kV DM) • IEC/EN61000-4-5 Surge Signal Port (1-kV indoor, 2-kV outdoor) • IEC/EN61000-4-5 Surge DC Port (1 kV) • IEC/EN61000-4-6 Immunity to Conducted Disturbances (10 Vrms) • IEC/EN61000-4-8 Power Frequency Magnetic Field Immunity (30 A/m) • IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations

Feature	Description
ETSI and EN	<ul style="list-style-type: none"> EN 300 386 Telecommunications Network Equipment (EMC) EN55022 Information Technology Equipment (Emissions) EN55024 Information Technology Equipment (Immunity) EN50082-1/EN61000-6-1 Generic Immunity Standard
Network Equipment Building Standards (NEBS)	<p>This product is designed to meet the following requirements:</p> <ul style="list-style-type: none"> GR-1089-CORE EMC and Safety GR-63-CORE Physical Protection SR-3580 NEBS Criteria Levels (Level 3)

ORDERING INFORMATION

To place an order, contact your local Cisco Systems® representative or visit the ordering page on the Cisco Website. Use the ordering information in Table 7.

Table 7. Ordering Information

Product Part Number	Description
2OC192/POS-IR-SC(=)	2-port OC-192c/STM-64c POS line card, IR optics (Engine 6)
2OC192/POS-SR-SC(=)	2-port OC-192c/STM-64c POS line card, SR optics (Engine 6)
2OC192/POS-VSR(=)	2-port OC-192c/STM-64c POS line card, very-short-reach (VSR) optics (Engine 6)
OC192E/POS-LR-SC(=)	1-port OC-192/STM-64 POS line card, LR optics (Engine 4+)
OC192E/POS-IR-SC(=)	1-port OC-192c/STM-64c POS line card, IR optics (Engine 4+)
OC192E/POS-SR-SC(=)	1-port OC-192c/STM-64c POS line card, SR optics (Engine 4+)
OC192E/POS-VSR(=)	1-port OC-192c/STM-64c POS line card, VSR optics (Engine 4+)
8OC-48/POS-SFP(=)	8-port OC-48c/STM-16c POS line card, Small Form-Factor Pluggable (SFP) optics (Engine 6)
OC48X/POS-LR-SC(=)	1-port OC-48c/STM-16c POS line card, LR optics (Engine 3)
OC48X/POS-SR-SC(=)	1-port OC-48c/STM-16c POS line card, SR optics (Engine 3)
4OC48E/POS-LR-SC(=)	4-port OC-48c/STM-16c POS line card, LR optics (Engine 4+)
4OC48E/POS-SR-SC(=)	4-port OC-48c/STM-16c POS line card, SR optics (Engine 4+)
4OC12X/POS-M-SC-B(=)	4-port OC-12/STM-4c POS line card, multimode optics (Engine 3)
4OC12X/POS-I-SC-B(=)	4-port OC-12/STM-4c POS line card, multimode optics (Engine 3)
16OC3X/POS-I-LC-B(=)	16-port OC-3/STM-1 POS line card, IR optics (Engine 3)
16OC3X/POS-M-MJ-B(=)	16-port OC-3/STM-1 POS line card, multimode optics (Engine 3)
8OC3X/POS-IR-LC-B(=)	8-port OC-3/STM-1 POS line card, IR optics (Engine 3)
8OC3X/POS-MM-MJ-B(=)	8-port OC-3/STM-1 POS line card, multimode optics (Engine 3)
4OC3X/POS-LR-LC-B(=)	4-port OC-3/STM-1 POS line card, LR optics (Engine 3)
4OC3X/POS-IR-LC-B(=)	4-port OC-3/STM-1 POS line card, IR optics (Engine 3)
4OC3X/POS-MM-MJ-B(=)	4-port OC-3/STM-1 POS line card, multimode optics (Engine 3)

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FOR MORE INFORMATION

For more information about the Cisco 12000 Series POS interfaces, contact your local Cisco representative or visit: <http://www.cisco.com/go/12000>



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