

IP RAN Service Module for the Cisco ONS 15454 SONET/SDH Multiservice Provisioning Platform

The IP RAN Service Module for the Cisco[®] ONS 15454 SONET/SDH Multiservice Provisioning Platform (MSPP) is designed to aggregate optimized RAN backhaul transport links in the Cisco IP RAN Optimization solution.

Introduction

The Cisco[®] ONS IP RAN Service Module (product code: ONS-RAN-SVC) is specifically designed for the Cisco ONS 15454 SONET/SDH MSPP to optimize, aggregate, and transport mixed-generation Radio Access Network (RAN) traffic. It allows mobile wireless operators to significantly lower existing operating expenses (OpEx); cost-efficiently deploy new radio technologies such as UMTS/HSDPA and WiMAX voice and data networks; generate revenue from new cell-site IP-based services; and rapidly deploy next-generation mobile services.

The IP RAN Optimization aggregation node is the Cisco ONS 15454 SONET/SDH MSPP, a highly scalable and flexible carrier-class platform that provides aggregation and optimization services for RAN backhaul traffic at aggregation sites in a RAN. The Cisco ONS platform enables the mobile network operator to aggregate hundreds of T1/E1's worth of traffic on a single highly reliable platform built with compliance to standards. This platform enables transition of older TDM services to packet infrastructure in the RAN.

Together with a cell-site router, such as the Cisco MWR 1941-DC-A or Cisco 3825-DC, the IP RAN Service Module and the Cisco ONS 15454 SONET/SDH MSPP enable a variety of RAN solutions by extending IP connectivity to GSM/GPRS/EDGE base transceiver stations (BTSs), UMTS/HSDPA Node Bs, CDMA/CDMA-2000/EV-DO BTSs, and other ancillary cell-site equipment. It transparently and efficiently transports cell-site voice, data, and signaling traffic over IP using traditional T1/E1 circuits, including leased line, microwave, and satellite, as well as alternative backhaul networks, including DSL, EFM, Metro Ethernet, and WiMAX.

The primary Cisco IP Optimized RAN transport solutions, which may be deployed separately or in combination to suit the operator's specific network and business needs, include:

- Optimized RAN transport over IP: Maximizes GSM/GPRS/EDGE, UMTS/HSDPA, and 4G voice and data call density per T1/E1 over the RAN transport network to reduce backhaul transmission costs, which are typically the largest operational expenses in the network.
- Broadband and Ethernet RAN backhaul: Allows for a variety of backhaul transport media enabling higher-capacity and/or lower-cost alternative RAN transport for GSM, CDMA, and UMTS networks, such as DSL, WiMAX, and Metro Ethernet. Higher-speed broadband backhaul, such as DSL and Metro Ethernet, is ideally suited for transport of HSDPA, CDMA EV-DO, and WiMAX data traffic.

- Cell-site operations support networks: Enables telemetry to cell sites for remote operations and network element management of the ancillary cell-site equipment to reduce costly site visits and improve operational efficiency.
- Cell-site IP points of presence (POPs): Offer new revenue-generating IP services and applications at every cell site.

Table 1 lists the advantages and benefits of the Cisco IP Optimized RAN solutions for mobile wireless operators.

Table 1. Important Advantages and Benefits of the Cisco IP Optimized RAN Solutions

Solution	Advantage	Benefit
Optimized RAN transport over IP	<ul style="list-style-type: none"> • 50% measured T1/E1 efficiency gain on GSM and UMTS • Reduced bandwidth needs • Bit-transparent • RAN vendor-independent • No change to existing RAN design • Cisco Optimized Pseudowire Emulation (PWE) • Statistical multiplexing • T1/E1 "bonding" with Multilink PPP (MLPPP) • Single converged IP backhaul serving 2G/3G/4G • QoS by traffic type and radio • Dynamic bandwidth sharing • Decouple RAN technology from transport • IMA termination at the cell site • Enhanced reliability • 3GPP-compliant transport • Investment protection 	<ul style="list-style-type: none"> • Substantial OpEx reduction • Growth in GSM revenue without increasing costs • Expanded call-carrying capacity of existing T1/E1 RAN • Utilization of existing T1/E1 capacity from GSM to also handle UMTS • Ability to begin Node B rollouts immediately and pre-wire additional UMTS capacity • Faster rollouts • Loss of T1/E1 span does not result in loss of service • Multiple traffic classes supported on common network • Per-technology bandwidth monitoring and tracking • Seamless support for natural 2G to 3G migration • Broadband and Ethernet backhaul-ready • Utilize standards as broadband and Ethernet backhaul become available • Reduced ATM spending, investment in IP – the future • Risk-free BSS upgrades • Positioning for 3G evolution to native IP
Broadband and Ethernet RAN backhaul	<ul style="list-style-type: none"> • Backhaul-media-independent (xDSL, EFM, Metro Ethernet, WiMAX, etc.) • UMTS, HSPA, EVDO, WiMAX offload • Cisco optimized PWE and IETF PWE3 • ATM PVC routing for UMTS • Rapid network expansion • Single converged IP/Ethernet/MPLS backhaul 	<ul style="list-style-type: none"> • Lower-cost broadband IP backhaul options • Substantial OpEx reduction • Quick response to growth demands • Simplified network management and backhaul provisioning • Ability to route different traffic types over different backhaul media types • Optimal matching of backhaul network capacity and SLA • Multi-radio/multi-backhaul capability • Load-balancing across backhaul options • Backup paths
Cell-site IP POPs and operations support networks	<ul style="list-style-type: none"> • New revenue-generating services • Intelligent IP services • Cell-site telemetry and LAN extension • 4G-ready 	<ul style="list-style-type: none"> • Ability to reach new customers • RAN security • Fewer site visits and shorter mean time to repair (MTTR) • Rapid deployment of next-generation services

Figure 1. Cisco ONS IP RAN Service Module



Cisco ONS IP RAN Service Module Overview

The primary software and hardware features of the Cisco ONS IP RAN Service Module are described in the following sections.

Software Features

The software for the Cisco ONS IP RAN Service Module is tailored for IP RAN transport, and includes several Cisco IOS[®] Software features specifically developed for such applications. These features include Cisco patent-pending Optimized Pseudowire Emulation (PWE), or GSM Abis/Ater and UMTS Iub Optimization over IP, which provides optimization to improve backhaul transport efficiency. Another important feature is Cisco ATM PVC Routing, which provides the ability to route different types of 3G traffic over different types of backhaul media, while providing load-balancing and backup paths. For example, in some DSL backhaul networks the downlink supports much higher capacity than the uplink. Cisco ATM PVC Routing optimally matches High-Speed Downlink Packet Access (HSDPA) transport to these asymmetric backhaul networks by routing higher-bandwidth downstream traffic over DSL links, while the lower-bandwidth upstream traffic is routed over “bonded” T1/E1 links.

The Cisco IOS Software features supported on the IP RAN Service Module include:

- N:1 redundancy
- Cisco Optimized Pseudowire Emulation (PWE)
- Cisco Abis/Ater and Iub Optimization over IP
- IEEE 802.1q and IEEE 802.1p
- Layer 2 Tunneling Protocol Version 3 (L2TPv3)
- Generic Routing Encapsulation (GRE)
- Point-to-Point Protocol (PPP) and Multilink PPP (MLPPP)
- Asymmetric Optimized PWE and Optimized PWE over GRE for HSDPA offload

- User Datagram Protocol (UDP) and compressed Real Time Protocol/compressed UDP (cRTP/cUDP), Address and Control Field Compression (ACFC)
- ATM PVC Routing, ATM Segmentation and Reassembly (SAR)
- High-Level Data Link Control (HDLC)
- Hot Standby Routing Protocol (HSRP), Open Shortest Path First (OSPF) Protocol, Border Gateway Protocol (BGP), Routing Information Protocol (RIP), IP Multicast, Bidirectional Forwarding Detection (BFD), Intermediate System-to-Intermediate System (IS-IS)
- IP Precedence, traffic shaping and policing, Priority Queuing (PQ), Weighted Fair Queuing (WFQ), Class-Based Weighted Fair Queuing (CBWFQ), Low Latency Queuing (LLQ), Weighted Round Robin (WRR), DiffServ
- Congestion management: The software includes a comprehensive backhaul congestion-management system that allows it to monitor the data rates and then alarm and control the traffic rates of specific traffic types, based on user-defined congestion conditions.
- PPP over Ethernet (PPPoE), PPP Authentication Protocol (PAP), Challenge Handshake Authentication Protocol (CHAP), Secure Shell (SSH) Protocol Version 2, access control lists (ACLs)
- Network Timing Protocol (NTP)
- Network Address Translation (NAT), Dynamic Host Configuration Protocol (DHCP), IP Control Protocol (IPCP)
- Detailed management support: The IP RAN Service Module is managed via the Cisco Mobile Wireless Transport Manager element management system, which allows simplified and scalable network element management and advanced statistics reporting on the overall health of the RAN backhaul.

Hardware Overview

The Cisco ONS 15454 MSPP enables service providers to build robust, scalable, multiservice transport networks to support their metropolitan-area (metro) or regional, public, and private communications needs. The Cisco ONS 15454 is the first in its class to consolidate SONET/SDH, dense wavelength division multiplexing (DWDM) transmission, Layer 2 and Layer 3 packet-processing functions, and storage area network (SAN) transport with the intelligence of IP RAN optimization in a single, cost-effective platform. Designed for metro and regional networks, the Cisco ONS 15454 offers a wide mixture of data, voice, and video service interfaces, efficient bandwidth aggregation, and scalable transport bandwidth from 155 Mbps (OC-3/STM-1) to 10 Gbps (OC-192/STM-64) and integrated DWDM transmission for continued network scalability. The Cisco ONS 15454 provides operational simplicity by using the Cisco Transport Controller – an integrated, network-based GUI – to simplify the setup, provisioning, and maintenance of the transport network. A powerful element management system, the Cisco Mobile Wireless Transport Manager assists with monitoring the RAN's health and allows integration to operations support systems and network management systems. With such advanced capabilities and management and planning tools, the Cisco ONS 15454 can provide a solid foundation for growing communications infrastructures.

The Cisco ONS IP RAN Service Module consists of four independent Cisco IOS processors. Each IP RAN Service Module has four 10/100/1000 Gigabit Ethernet (RJ-45) ports with one port connected to each Cisco IOS processor. The IP RAN Service Module is also equipped with four VC-4 level packet-over-SONET (POS) interfaces and four VC-4 level ATM interfaces and up to 80

DS-0 level backplane interfaces for short-haul applications, and up to 40 DS-0 level backplane interfaces for backhaul applications. One Cisco IOS processor is dedicated as a service processor while the remaining three Cisco IOS processors are dedicated as traffic processors. The Cisco ONS IP RAN Service Module also includes two RJ-45 ports, one used as a DCE console (labeled Console) and the other used as a debug port (covered with a tab plate).

System Specifications

Table 2 lists specifications for the Cisco ONS 15454 MSPP.

Table 2. Cisco ONS 15454 MSPP Specifications

Parameter	Specification
Physical dimensions	<p>ANSI shelf assembly: 19- or 23-in. EIA rack-mounting H x W x D: 8.5 x 17.6 x 12.0 in. (470 x 445 x 305 mm)</p> <p>ETSI shelf assembly: ETSI and 19-in. rack-mounting H x W x D: 24.3 x 17.5 x 11.0 in. (616.5 x 445 x 280 mm)</p>
Power	<p>Dual-power input terminal block, voltage monitored with threshold crossing alarms (TCAs)</p> <p>Voltage: –48 VDC nominal –40.5 to –56.7 operating range</p> <p>Current: 5A minimum 22A maximum at nominal voltage*</p>
Weight	<p>ANSI: 55 to 80 lb (25 to 36.3 kg)</p> <p>ETSI: 80 to 110 lb (36.2 to 49.8 kg)</p>

* Maximum current draw is based upon shipping system configuration, not equipment design limits.

Table 3 describes the ANSI chassis for the Cisco ONS 15454 MSPP.

Table 3. ANSI Chassis Mechanical Systems

System Component	Description
Chassis	17 front-access common and interface card slots, integrated fan-tray slot
Fan-tray assembly	6-fan module assembly, integrated liquid crystal display
Electrical interface options	Rear access, A-side + B-side
BNC	DS-3 and EC-1; 96 Tx/Rx (maximum)
Subminiature B (SMB)	DS-3 and EC-1, DS-1 with balun; 168 Tx/Rx (maximum)
AMP CHAMP	DS-1; 168 Tx/Rx (maximum)
Wire wrap	DS-1; 168 Tx/Rx (maximum), SMB EIA required
UBIC	DS-1; 224 Tx/Rx (maximum) DS-3 and EC-1; 192 Tx/Rx (maximum)

Table 4 describes the ETSI chassis for the Cisco ONS 15454 MSPP.

Table 4. ETSI Chassis Mechanical Systems

System Component	Description
Chassis	17 front-access common and interface card slots; 12 front-access electrical, power, and timing slots; integrated fan-tray slot
Fan-tray assembly	6 fans, integrated liquid crystal display
Electrical interface options	Front access
T54 (1.0/2.3)	E1: 336 Tx/Rx (maximum) E3, DS-3; 120 Tx/Rx (maximum) E4: 32 Tx/Rx (maximum)
Low-force helix (LFH) connector	E1: 336 Tx/Rx (maximum)

Cisco ONS 15454 Regulatory Standards

Industry Requirements

- Network Equipment Building Standards (NEBS) Level 3 (GR-1089-CORE and GR-63-CORE)
- SONET (GR-253-CORE, GR-1400-CORE, and GR-1230-CORE)
- SDH (G.703, G.704, G.707, G.781, G.782, G.783, G.813, G.841 G.957, and G.691)
- IEEE (802.1)

Safety

- CAN/CSA-C22.2 No. 950-95 Third Edition, December 1, 2002
- GR-1089-CORE Level 3
- UL 60950 Third Edition
- EN 60950 (to A4)
- IEC 60950 / EN 60950, Third Edition
- IEC 60950-1 / EN 60950-1, 1st Ed. (CB Report/Certificate with all country deviations)
- UL and cUL / CSA 60950-1 1st Ed.

EMC Emissions (Radiated, Conducted)

- ICES-003
- GR-1089-CORE Level 3
- 47CFR15
- CISPR22
- EN 300 386-TC
- EN55022

EMC Immunity

- GR-1089-CORE Level 3
- CISPR24
- EN300-386-TC
- EN55024

Environnemental

- GR-63-CORE
- ETS 300 019-2-1 (Storage, class 1.1)
- ETS 300 019-2-2 (transportation, class 2.3)
- ETS 300 019-2-3 (operational, class 3.1E) with extended air temperature (Class 3.4)

Ordering Information

The Cisco ONS IP RAN Service Module part number is ONS-RAN-SVC. Table 5 lists the Cisco ONS 15454 part numbers.

Table 5. Recommended Cisco ONS 15454 Components

Cisco ONS 15454 ANSI System			
Cisco ONS 15454 ANSI System	Core Components		
		Part Number	Description
	Permit Assemble to Order	CISCO15454	15454 ATO (Assemble to Order)
	Shelf Assembly	15454-SA-HD	15454 SA HD NEBS3 ANSI w/ RCA and Ship Kit
	Fan Tray Assembly	15454-CC-FTA	15454 SA HD NEBS3 ANSI w/ RCA and Ship Kit
	Alarm Interface Card	15454-AIC-I	Alarm Interface Card Enh Intl, I-Temp
	Timing, Communications, and Control	15454-TCC2P-K9	Timing Communications Control Two Plus, I-Temp
	Cross-Connect Card	15454-XC-VXC-10G	Cross-Connect Module, High Cap. Tributary
	RAN Service Module	ONS-RAN-SVC	ONS 15454 RAN Service Module
	T1 Interface Options		
	T1, Low-Speed Slot	15454-DS1E1-56	DS1/ E1, 1:N, 56 ports, I-Temp, SONET System
	OC-3 Interface Options		
	OC3, Any-Speed Slot	15454-MRC-I-12	OC3/12/48, 12 ports, IOF
	Multimode SFP	ONS-SI-155-SR-MM	SFP - OC3/STM1, SR, 1310 NM, MULTI MODE, I-TEMP
	Single-mode OC3/STM1 IR 1310 SFP	ONS-SI-155-I1	SFP – OC3/STM1, IR 1310 NM, SMF, I-TEMP
	Single-mode OC3/STM1 LR 1310 SFP	ONS-SI-155-L1	SFP – OC3/STM1, LR 1310 NM, SMF, I-TEMP
Single-mode OC3/STM1 LR 1550 SFP	ONS-SI-155-L2	SFP – OC3/STM1, LR LR1550 NM, SMF, I-TEMP	
Single-mode OC3/STM1 CWDM SFP	ONS-SE-155-1xx0	SFP – OC3/STM1, CWDM, <various nm>, SFP	
Cisco ONS 15454 ETSI System			
Cisco ONS 15454 ETSI System	Core Components		
		Part Number	Description
	Permit Assemble to Order	CISCO15454E	15454E ATO (Assemble to Order)
	Shelf Assembly	15454E-SA-ETSI	ONS 15454 SDH ETSI Chassis and Ship-Kit
	Fan Tray Assembly	15454E-CC-FTA	48V Controlled Cooling Fan Tray with Filter for ETSI Chassis
Alarm Interface Card	15454E-AIC-I	SDH Alarm Interconnect module – ANSI/ETSI Support	

		15454E-AP-MIC48V	ONS 15454 SDH Alarm, -48V Power Mgmt IF Conn
		15454E-CTP-MIC48V	ONS 15454 SDH Craft, Timing, -48V Power Mgmt IF Conn
	Timing, Communications, and Control	15454E-TCC2P-K9	Timing Communications Control 2 Plus, ITemp-ANSI/ETSI Support
	Cross-Connect Card	15454E-XC-VXC-10G	SDH HO/LO XC, 60G VC-4, 5G VC-12/11 – ANSI/ETSI Support
	RAN Service Module	ONS-RAN-SVC	ONS 15454 RAN Service Module
E1 Interface Options			
	E1 Electrical Interface	15454E-E1-42	High Density 42-Port E1 Card
	FMEC	15454E-E1-120PROA	HD E1 120 ohm FMEC, 1:3 protection Side A
		15454E-E1-120PROB	HD E1 120 ohm FMEC, 1:3 protection Side B
	Ohm Conversion	15454E-E1-755BB	External 75/120 Ohm E1 Converter
STM-1 Interface Options			
	STM-1 Optical Interface	15454E-MRC-I-12	STM1/4/16, 12 ports, IOF - ANSI/ETSI Support
	Multimode SFP	ONS-SI-155-SR-MM	SFP – OC3/STM1, SR, 1310 NM, MULTI MODE, I-TEMP
	Single-mode OC3/STM1 IR 1310 SFP	ONS-SI-155-I1	SFP – OC3/STM1, IR 1310 NM, SMF, I-TEMP
	Single-mode OC3/STM1 LR 1310 SFP	ONS-SI-155-L1	SFP – OC3/STM1, LR 1310 NM, SMF, I-TEMP
	Single-mode OC3/STM1 LR 1550 SFP	ONS-SI-155-L2	SFP – OC3/STM1, LR LR1550 NM, SMF, I-TEMP
	Single-mode OC3/STM1 CWDM SFP	ONS-SE-155-1xx0	SFP – OC3/STM1, CWDM, <various nm>, SFP

For Cisco ONS 15454 part descriptions, please visit:

<http://www.cisco.com/en/US/products/hw/optical/ps2006/index.html>

Service and Support

The award-winning service and support offerings from Cisco provide presales network-audit planning, design consulting, network implementation, operational support, and network optimization. By including service and support when purchasing the IP RAN Optimization solution, customers can confidently deploy a network architecture using Cisco expertise, experience, and resources.



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