

Cisco MWR 2941-DC Mobile Wireless Router

Cell-Site Access switch/router platform custom-designed to support the seamless backhaul of Radio Access Network (RAN) traffic from the cell site over T1/E1, Carrier Ethernet, MPLS, and IP transport networks.

Introduction

The Cisco® MWR 2941-DC Mobile Wireless Router is a cell-site access platform specifically designed 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 Universal Mobile Telecommunications Service (UMTS)/High Speed Packet Access (HSPA)/Long Term Evolution (LTE) and WiMAX voice and data networks; generate revenue from new cell-site IP-based services; and facilitate rapid deployment of next-generation mobile services.

Custom designed for the cell site, the Cisco MWR 2941-DC features a small form factor, extended operating temperature, and cell-site DC input voltages. It comprises a high-performance architecture, driven by a powerful Cisco IOS® Software host processor joined with a network processing engine and clocking and synchronization complex, combined with application-specific Cisco IOS Software–based operating software tailored for IP RAN transport. The Cisco MWR 2941-DC is a purpose built platform providing density, flexibility, and a variety of connectivity options at the cell site through support for select interface cards from the Cisco 2800 and 3800 Series Integrated Services Router platforms.

The Cisco MWR 2941-DC helps enable a variety of RAN solutions by extending IP connectivity to Global System for Mobile Communications (GSM)/General Packet Radio Service (GPRS)/Enhanced Data Rates for GSM Evolution (EDGE) base transceiver stations (BTSs), UMTS/HSPA/LTE Node Bs, Code Division Multiple Access (CDMA)/CDMA-2000/EVDO BTSs, WiMAX 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 Carrier Ethernet, DSL, and WiMAX. It also supports standards-based Internet Engineering Task Force (IETF) Internet protocols over the RAN transport network, including those standardized at the Third-Generation Partnership Project (3GPP) for IP RAN transport.

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, and UMTS/HSPA 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.
- IP/Multiprotocol Label Switching (MPLS) RAN backhaul: Allows for a variety of backhaul transport media facilitating higher-capacity and/or lower-cost alternative RAN transport for GSM, CDMA, UMTS, and WiMAX networks, such as Carrier Ethernet, DSL, and WiMAX

networks. Higher-speed broadband backhaul, such as DSL and Carrier Ethernet, is ideally suited for transport of HSPA/LTE, CDMA EVDO, and WiMAX data traffic.

- Cell-site operations support networks: Facilitates 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
IP/MPLS RAN backhaul	Backhaul media independent (Carrier Ethernet, DSL, EFM, WiMAX, and so on) UMTS, HSPA, EVDO, WiMAX offload IETF ATM and TDM PWE3 ATM permanent virtual circuit (PVC) routing for UMTS Rapid network expansion Single converged IP/Ethernet/MPLS backhaul Multiple clocking options Layer 2 and Layer 3 services Cisco IOS Software IP service-level agreement (SLA)	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 Multiradio/multibackhaul capability Load-balancing across backhaul options Backup paths
Cell-site IP POPs and operations support networks	New revenue-generating services Intelligent IP services Cell-site telemetry and LAN extension 4G ready	Ability to reach new customers RAN security Fewer site visits and shorter Mean Time to Repair (MTTR) Rapid deployment of next-generation services
Optimized RAN transport over IP	50 percent measured T1/E1 efficiency gain on GSM RAN vendor independent No change to existing RAN design Cisco Optimized pseudowire emulation (PWE) Statistical multiplexing T1/E1 "bonding" with Multilink Point-to-Point Protocol (MLPPP) Single converged IP backhaul serving second generation (2G)/third generation (3G)/4G Quality of Service (QoS) by traffic type and radio Dynamic bandwidth sharing Decouple RAN technology from transport Inverse Multiplexing over ATM (IMA) termination at the cell site Enhanced reliability 3GPP-compliant transport Investment protection	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 prewire 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 base station subsystem (BSS) upgrades Positioning for 3G evolution to native IP

The Cisco MWR 2941-DC Mobile Wireless Router (Figure 1) delivers a compact, high-performance, and flexible cell-site access platform designed specifically for IP optimization of

RANs, facilitating profit-enhancing solutions for today's mobile networks and offering flexibility to evolve as future growth and business needs require.

Figure 1. Cisco MWR 2941-DC Mobile Wireless Router



Cisco MWR 2941-DC Mobile Wireless Router Overview

The primary hardware and software features of the Cisco MWR 2941-DC Mobile Wireless Router are described in the following overviews.

Hardware Overview

The Cisco MWR 2941-DC includes the following hardware features:

- Stackable, low-power, 1-rack-unit (RU), 12.5-inch-deep, 19-inch rack-mount form factor with front-to-back airflow
- TDM backplane
- DS0-grooming and drop-and-insert
- Common clock distribution across the chassis
- Front-panel access cabling and LED indicators
- One external timing input (BITS)
- 16 integrated RJ-45 T1/E1 ports
- Four integrated RJ-45 100/1000BASE-T ports
- Two integrated 1000BASE-X Small Form-Factor Pluggable (SFP) ports
- One integrated 115.2-Kbps combined console and auxiliary port
- Two integrated high-speed WAN interface card (HWIC) slots that support select cards from the Cisco 2800 and 3800 Series
- Network processing engine for integrated hardware-accelerated network services
- Clocking and synchronization complex for integrated timing over packet features
- Built in Layer 2 Gigabit Ethernet switch supporting line rate traffic
- Stratum 3 network clock
- -4 to 140°F (-20 to 60°C) extended operating temperature
- 20 to 60 VDC (±) universal power supply
- Supports dual A and B DC power feeds with a single Euro Style 4 Position Connector
- 512 MB DRAM, 128 MB external compact flash memory

- Simple GUI-based management with Cisco Mobile Wireless Transport Manager (MWTM)

Software Overview

The software for the Cisco MWR 2941-DC is tailored for IP RAN transport and includes several Cisco IOS Software features specifically developed for such applications. These features include Adaptive Clock Recovery, IEEE 1588-2008, ITU-T Synchronous Ethernet, IETF ATM and TDM Pseudowire Emulation Edge to Edge, and Cisco patent-pending Optimized Pseudowire Emulation, including GSM Abis/Ater 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 HSPA 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 software available for the Cisco MWR 2941-DC supports Cisco IOS Software running on the host processor and microcode running on the network processor to provide hardware acceleration to increase performance of PWE3 protocols, GSM Abis optimization over IP, and ATM network services such as ATM cell segmentation and reassembly (SAR), ATM AAL0 (for AAL2 voice/data), AAL5, and IMA v1.0 and v1.1.

The Cisco IOS Software features supported on the Cisco MWR 2941-DC include:

- Structure-Agnostic TDM over Packet (SAToP) – RFC 4553
- Structure-Aware TDM Circuit Emulation Service over Packet Switched Network (CESoPSN) – RFC 5086
- Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks – RFC 4717
- Pseudowire Emulation Edge-to-Edge (PWE3) Asynchronous Transfer Mode (ATM) Transparent Cell Transport Service – RFC 4816
- Pseudowire Setup and Maintenance using the Label Distribution Protocol (LDP) – RFC 4447
- IETF ATM Pseudowire Emulation Edge to Edge (PWE3) over MPLS; Transparent Cell Transport Service/ATM Port Mode; ATM AAL5 CPCS-SDU Mode; ATM N:1 and 1:1 VCC cell mode; ATM N:1 VP Cell Relay Mode; ATM Port Cell Relay Service; ATM cell packing; VPI and/or VCI rewrite
- Structure-Agnostic TDM over Packet (SAToP) and Circuit Emulation Service over Packet Switched Network (CESoPSN)
- T1/E1 line timing, Adaptive Clock Recovery, ITU-T Synchronous Ethernet, IEEE 1588-2008
- Network Timing Protocol (NTP)
- ATM PWE3 redundancy
- IEEE 802.1q VLANs
- Cisco IOS Software IP SLA
- MPLS
- Point-to-Point Protocol (PPP) and MLPPP

- User Datagram Protocol (UDP) and compressed Real Time Protocol/compressed UDP (cRTP/cUDP), Address and Control Field Compression (ACFC)
- IMA v1.0, 1.1, ATM SAR, ATM AAL0 (for AAL2 voice/data), AAL5, ATM Class of Service (CoS) features CBR and UBR, per virtual circuit queuing, ATM PVC Routing
- High-Level Data Link Control (HDLC)
- Open Shortest Path First (OSPF) protocol, Bidirectional Forwarding Detection (BFD)
- Label Distribution Protocol (LDP)
- IP Precedence (Type of Service or ToS), DiffServ (Differentiated Services Code Point or DSCP) traffic shaping and policing, Priority Queuing, Weighted Fair Queuing (WFQ), Class-Based Weighted Fair Queuing (CBWFQ), Low Latency Queuing (LLQ), Weighted Round Robin (WRR)
- PPP over Ethernet (PPPoE), PPP Authentication Protocol (PAP), Challenge Handshake Authentication Protocol (CHAP), Secure Shell (SSH) Protocol Version 2, access control lists (ACLs)
- Dynamic Host Configuration Protocol (DHCP), IP Control Protocol (IPCP)
- Cisco GSM Abis optimization over IP

Table 2 lists important features and benefits of the Cisco MWR 2941-DC Mobile Wireless Router.

Table 2. Important Features and Benefits of Cisco MWR 2941-DC

Feature	Benefit
Custom-Built for the Cell Site	
Small form factor	<ul style="list-style-type: none"> • 1-RU/12.5-in. (31.75-cm)-deep chassis preserves limited rack space available at the cell site
Universal DC power supply	<ul style="list-style-type: none"> • Compatible with the range of DC input voltages specifically available at cell sites • Facilitates deployment at either 27 VDC or –48 VDC cell sites • Dual A and B DC power feeds support redundant power sources
Extended operating temperature	<ul style="list-style-type: none"> • Functions reliably in cell sites subject to higher operating temperatures • Low power operation makes more efficient use of cell-site batteries and produces less heat
Front panel access cabling and LED indicators	<ul style="list-style-type: none"> • Facilitates easy access and at-a-glance activity status
High-Performance Architecture Designed for RAN Aggregation, Optimization, and Transport	
Hardware-accelerated network services	<ul style="list-style-type: none"> • Provides hardware-accelerated GSM Abis/Ater and UMTS Iub transport over T1/E1 or IP backhaul with up to 50 percent traffic optimization or greater, CESoPSN, SAToP, ATM PWE3 over MPLS and L2TPv3 • Facilitates ATM segmentation and reassembly and IMA • Achieves proven transparency in GSM, UMTS, CDMA, WiMAX networks
Unique software bundle for RAN transport and optimization	<ul style="list-style-type: none"> • Customized Cisco IOS Software–based software boosts performance and availability of IP optimized RAN applications and backhaul-independent transport
Multiple clocking options	<ul style="list-style-type: none"> • Allows choices for clocking to match backhaul media and requirements
Cell-Site IP Connectivity	
Optimized RAN transport over IP IP/MPLS RAN backhaul Cell IP POPs	<ul style="list-style-type: none"> • Maximizes voice and data call density per T1/E1 • Provides higher-capacity and lower-cost alternative RAN transport backhaul media • Facilitates new revenue-generating IP services and applications; cell-site telemetry
Investment Protection	
Flexible fixed port and modular architecture	<ul style="list-style-type: none"> • Combination of fixed ports and HWICs gives greater density and flexibility to customize for specific network requirements and to create new configurations as requirements change • Network interfaces are field-upgradeable to accommodate future technologies

Cisco IOS Software	<ul style="list-style-type: none"> • Supports Cisco IOS Software features in common with the Cisco 2800 and 3800 Series Routers • New releases of Cisco IOS Software add support for new services and applications • Cisco IOS Software QoS features allow concurrent GSM/UMTS or CDMA and IP application traffic to be transported over a common backhaul network without any impact to GSM/UMTS or CDMA traffic and voice/data quality
Platform Manageability	
Cisco MWTM	<ul style="list-style-type: none"> • Allows simplified and scalable network element management, performance monitoring, and advanced statistics reporting

Specifications

Table 3 lists the system specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 3. Cisco MWR 2941-DC System Specifications

Description	Specification
Processor types	Cisco IOS Software host processor, network processor, clocking and synchronization complex
Flash memory (compact flash memory)	External: 128 MB
System memory	512 MB (DRAM default)
Integrated HWIC slots	2
Onboard T1/E1 ports	16
Onboard Ethernet ports	4 100/1000 RJ-45 Gigabit Ethernet ports 2 1000 SFP Gigabit Ethernet ports
Console and auxiliary port	1 (up to 115.2 Kbps)
External timing input (BITS)	1
Power	DC only
Dimensions (H x W x D)	1.72 x 17.5 x 12.5 in. (4.37 x 44.45 x 31.75 cm)
Weight (without network modules or WICs)	12 lb (5.44 kg)
Rack mounting	19 in.
Standard components	Front-to-back airflow 1-RU-high chassis Front-panel access cabling and LED indicators

Table 4 lists the power specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 4. Cisco MWR 2941-DC Power Specifications

Description	Specification
DC-input power and power dissipation	65 W maximum
DC-input voltage rating	20 to 60 VDC, 27 VDC or -48 VDC nominal, 60 VDC maximum
DC-input current rating	3.25 A maximum
Power connector	4 Position Euro Style Connector, A & B DC Power, AMPHENOL ELFP04210, MOLEX 0395300004 (P1 = + A PWR, P2 = -A PWR, P3 = -B PWR, P4 = +B PWR.

Table 5 lists the environmental specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 5. Cisco MWR 2941-DC Environmental Specifications

Description	Specification
Operating temperature	-4 to 131°F (-10 to 55°C)
Nonoperating temperature	-40 to 185°F (-40 to 85°C)
Relative humidity	5 to 90 percent noncondensing, ±5 percent

Operation altitude	13800 ft (4000 m) maximum 104°F (40°C) ambient
Noise level	63.5 dBA
Airflow	18 cfm

Table 6 lists the regulatory standards compliance specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 6. Cisco MWR 2941-DC Regulatory Standards Compliance

Description	Specification
Safety	UL/CUL 60950 CAN/CSA-C22.2 No. 950 EN 60950 IEC 60950 AS/NZS 3260 CE Marking
EMC	FCC Part 15 (CFR 47) Class A CISPR22 Class A ICES-003 Class A EN55022 Class A EN300386 Class A EN55024 EN50082-1 EN61000-3-2 EN61000-3-3 EN61000-6-1 VCCI Class A AS/NZS 3548 Class A CE Marking

Table 7 describes the HWICs supported on the Cisco MWR 2941-DC Mobile Wireless Router.

Table 7. Cisco MWR 2941-DC HWICs

WIC and VWIC Part Number	Description
HWIC-4T1/E1	4-port T1/E1 HWIC

Ordering Information

Table 8 gives ordering information for Cisco MWR 2941-DC Mobile Wireless Routers.

Table 8. Cisco MWR 2941-DC Mobile Wireless Router

Cisco MWR 2941-DC Part Number	Description
MWR-2941-DC	Cisco MWR 2941-DC Mobile Wireless Router
ASM-M2900-TOP	Timing over Packet Accessory Service Module for the Cisco MWR 2900 Series Mobile Wireless Routers

Summary

In current cellular networks, the RAN accounts for a significant percentage of total operational expenditures. By using the Cisco MWR 2941-DC Mobile Wireless Router, operators can simplify and optimize their current RANs with a compact, high-performance, and modular cell-site access platform, reducing operating costs and enhancing profit opportunities. These flexible and agile RANs can easily adapt to accommodate new radio and networking technologies and services as future growth and business needs require.

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 Cisco MWR 2941-DC Mobile Wireless Router, customers can confidently deploy a network architecture using Cisco expertise, experience, and resources.



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