Cisco MWR 2941-DC Mobile Wireless Router

The Cisco® MWR 2941-DC Mobile Wireless Router sets the standard for cell-site investment protection of Radio Access Network (RAN) backhaul for multiple generations of radio and media technology. By using the Cisco MWR 2941-DC, operators can simplify and converge their current RANs with a compact, high-performance, and modular cell-site access platform, reducing operating costs and enhancing profit opportunities.

RAN cell sites are places of transformation between mobile radio and mobile transport networks. Cost-effective RAN backhaul requires the ability to simultaneously aggregate the transport of traffic from both legacy and new-generation radios for specific and multiple transport options available at the cell site. The Cisco MWR 2941-DC is designed to optimize this radio-to-transport transformation and provide scalable interfaces for existing radios and transport networks as well as the new generation of 4G radios, microwave, and IP RAN transport networks.

Product Overview

The Cisco MWR 2941-DC Mobile Wireless Router (Figure 1) is a cell-site gateway specifically designed to clock, aggregate, and backhaul mixed-generation RAN traffic. The Cisco MWR 2941-DC prioritizes and processes cell-site voice, data, and signaling traffic as part of the Cisco Unified RAN Backhaul solution for reliable transport across any available backhaul networks, including E1/T1, ATM, Carrier Ethernet, microwave, WiMAX, and satellite networks. Custom designed for the cell site, the Cisco MWR 2941-DC features a small form factor, superior clocking, extended operating temperatures, and cell-site DC input voltages. It includes a high-performance host processor joined with a powerful dataplane network processing engine, a line-rate Level 2 switch, precise clocking and synchronization, and comprehensive Cisco IOS® Software customized for RAN backhaul applications.

Figure 1.   Cisco MWR 2941-DC Mobile Wireless Router

The primary benefits of Cisco Unified RAN Backhaul solutions with cell-site gateway include:

- **Line-rate cell-site traffic segmentation:** Allows you to segment traffic for backhauling 2G traffic and 3G voice over time-division multiplexing (TDM) infrastructure (T1/E1), while simultaneously using any available high-speed broadband networks (for example, Carrier Ethernet) to backhaul High-Speed Packet Access (HSPA) and Long-Term Evolution (LTE), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EVDO), and WiMAX data traffic
- **Cell-site aggregation and expansion:** Aggregates multiple base stations through multiple TDM, Ethernet, and IP interfaces
- **Pseudowire Emulation Edge to Edge (PWE3):** Supports Global System for Mobile Communications (GSM), CDMA, and Universal Mobile Telecommunications System (UMTS) traffic for high-capacity, low-cost RAN transport
- **Quality assurance:** Lets you apply quality of service (QoS) at the cell site for improved service-level assurance, even over noisy microwave links

- **Metro Ethernet support:** Allows you to manage and operate in both a PWE3 and Carrier Ethernet environment simultaneously by supporting line-rate Layer 2 Ethernet Operations, Administration, and Maintenance (EOAM, including Connectivity Fault Management [CFM], Ethernet Local Management Interface [E-LMI], and Ethernet in the First Mile [EFM]), Resilient Ethernet Protocol (REP), and QinQ

- **Cell-site operations support:** 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):** Allows you to offer new revenue-generating IP services and applications at every cell site

Hardware Overview

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

- Sixteen integrated RJ-45 T1/E1 ports

- Four integrated RJ-45 100/1000BASE-T ports

- Two integrated 1000BASE-X Small Form-Factor Pluggable (SFP) ports

- Built-in Layer 2 Gigabit Ethernet switch supporting line-rate traffic

- 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 Integrated Services Routers

- Network processing engine for integrated hardware-accelerated network services

- Clocking and synchronization complex for integrated Timing over Packet (ToP) features

- Stratum 3 network clock

- Common clock distribution across the chassis

- One external timing input (Building Integrated Timing Supply [BITS])

- One Pulse per Second (PPS) interface, 10-MHz interfaces, and one Time of Day (ToD) interface

- TDM backplane with DS-0 grooming and drop-and-insert

- Extended operating temperature: -4 to 140℉ (-20 to 60℃)

- 20 to 60 VDC (±) universal power supply

- Support for dual A and B DC power feeds with a single Euro-Style 4-position connector

- 512 MB DRAM and 128 MB external compact flash memory

Software Overview

The software for the Cisco MWR 2941-DC is customized for IP RAN transport and includes several Cisco IOS Software features specifically developed for such applications. These features include Adaptive Clock Recovery(ACR), IEEE 1588-2008, ITU-T Synchronous Ethernet (SynchE), and IETF ATM, TDM, and Ethernet Pseudowire Emulation Edge to Edge (PWE3). Another important feature is Cisco ATM permanent virtual circuit (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.

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, Multilink Point-to-Point Protocol (MLPPP), Multiprotocol Label Switching (MPLS), and ATM network services such as ATM cell segmentation and reassembly (SAR), ATM Adaption Layer 0 (AAL0) for AAL2 voice and data, AAL5, and Inverse Multiplexing over ATM (IMA) v1.0 and v1.1.

Table 1 lists the major Cisco IOS Software features supported on the Cisco MWR 2941-DC.

Table 1. Cisco MWR 2941-DC Software Features

Features
Metro Ethernet Services
• IEEE 802.3ah Ethernet in the First Mile (EFM) • IEEE 802.1q VLANs • IEEE 802.1q Tunneling (QinQ) with Layer 2 Tunneling Protocol (L2TP) • Ethernet over Multi Protocol Label Switching (EoMPLS): VLAN mode • Ethernet Local Management Interface (E-LMI) • IEEE 802.1ag Connectivity Fault Management (CFM) • IEEE 802.1ag Connectivity Fault Management (CFM) Extension for 1 + 1 Hot Standby • Ethernet Loopback (MAC Swap)
Pseudowire
• Support for Multiprotocol Label Switching (MPLS) and User Datagram Protocol (UDP); UDP is supported for Circuit Emulation Service over Packet Switched Network (CESoPSN) only • Pseudowire Setup and Maintenance using the Label Distribution Protocol (LDP) - RFC 4447 • Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP) - RFC 4553 • Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks - RFC 4717 • Pseudowire Emulation Edge-to-Edge (PWE3) ATM Transparent Cell Transport Service - RFC 4816 • Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN) - RFC 5086 • Circuit Emulation Service over Packet Switched Network (CESoPSN) over UDP/IP • ATM PWE3 Redundancy • IETF ATM Pseudowire Emulation Edge to Edge (PWE3) over MPLS • Transparent Cell Transport Service/ATM Port Mode • ATM AAL5 Common Part Convergence Sublayer-Service Data Unit (CPCS-SDU) Mode • ATM N:1 (N = 1) virtual channel connection (VCC) cell mode and ATM N:1 (N = 1) virtual path (VP) Cell Relay Mode • ATM Port Cell Relay Service; ATM cell packing • IMA v1.0, 1.1, ATM SAR, ATM AAL0 (for AAL2 voice and data), AAL5, ATM Class of Service (CoS) features constant bit rate (CBR) and unspecified bit rate (UBR), per virtual circuit queuing, and ATM PVC Routing
Layer 3 Services
• Label Distribution Protocol (LDP) with Label Edge Router (LER) and Label Switch Router (LSR) support • Point-to-Point Protocol (PPP) and Multilink Point-to-Point Protocol (MLPPP) • Hardware Assisted Layer 3 VPN (L3VPN) • Dynamic Host Configuration Protocol (DHCP) and IP Control Protocol (IPCP) • Address and Control Field Compression (ACFC) and PPP Protocol Field Compression (PFC) for MLPPP • Layer 3 Multicast • Open Shortest Path First (OSPF) • Border Gateway Protocol (BGP) • Intermediate System-to-Intermediate System (IS-IS)
IPv6
• Addressing and Discovery • Manual IPv6 Interface Addressing • ICMPv6 (RFC 4443) • IPv6 Duplicate Address Detection (RFC 4429) • IPv6 Neighbor Discovery (RFC 4861) • IPv4/IPv6 Dual Stack • IPv6 Static Routing • OSPF for IPv6 (RFC 5340) • BFDv6 (RFC 5881) • BFDv6+Static • BFDv6+OSPF • IPv6 QoS for Classification, Marking, Prioritization, Queuing, Scheduling, and Shaping • Hardware assisted IPv6 data forwarding • IPv6 over MPLS (6PE/6VPE)
QoS
• IEEE 802.1p QoS

Features
• IP Precedence Type of Service or (ToS)
• Differentiated Services Code Point (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)
• Cisco IOS Software IP Service-Level Agreement (SLA)
• Two-Way Active Measurement Protocol (TWAMP) – RFC 5357
Timing
• IEEE 1588 Boundary Clock
• IEEE1588-2008
• IEEE 1588 v2 Precision Time Protocol (PTP)
• T1/E1 line timing
• Adaptive Clock Recovery
• ITU-T Synchronous Ethernet (SyncE) with Ethernet Synchronization Messaging Channel (ESMC) support
• Synchronization Status Messages (SSM)
Security
• PPP Authentication Protocol (PAP)
• Challenge Handshake Authentication Protocol (CHAP)
• Secure Shell (SSH) Protocol v2
Availability
• Resilient Ethernet Protocol (REP) with support for no-neighbor and link status layer (LSL) age-out timer
• Cisco Express Forwarding (CEF) Load Sharing of Equal Cost Paths (ECMP)
• IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
• IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
• Bidirectional Forwarding Detection (BFD) support for OSPF, IS-IS, BGP, and Static Routes
Manageability
• Simple Network Management Protocol (SNMP)
• MIBs
• Command Line Interface (CLI)
• Cisco Active Network Abstraction (ANA): physical and logical inventory, and service-level views
• Cisco Prime™: fault, provisioning and performance management
• Cisco Mobile Wireless Transport Manager (MWTM)
• Cisco Networking Services-Configuration Engine (CNS-CE) over GE

Features and Benefits

Table 2 lists the advantages and benefits of the Cisco Unified RAN Backhaul solutions for mobile wireless operators.

Table 2.   Important Advantages and Benefits of the Cisco Unified RAN Backhaul Solution

Solution	Advantage	Benefit
RAN backhaul	• Backhaul-media-independent (Carrier Ethernet, EFM, WiMAX, and others) 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, and MPLS • Backhaul • Multiple clocking options • Layer 2 and Layer 3 services • Cisco IOS Software IP service-level agreement (SLA)	• Lower-cost backhaul options • Substantial operating expense (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 and multibackhaul capability • Load-balancing across backhaul options • Backup paths

Solution	Advantage	Benefit
Metro Ethernet	• Line-rate switching at Layer 2 • Fast REP convergence • 802.1ag CFM • 802.3ah EFM • E-LMI • QinQ	• Allows operator to support Metro Ethernet as well as legacy TDM transport using pseudowire • Line-rate performance at Layer 2 with features
Cell-site IP POPs and operations support networks	• New revenue-generating services • Intelligent IP services • Cell-site telemetry and LAN extension • 4G-readiness	• Ability to reach new customers • RAN security • Fewer site visits and shorter mean time to repair (MTTR) • Rapid deployment of next-generation services

Table 3 lists important features and benefits of the Cisco MWR 2941-DC Mobile Wireless Router.

Table 3.   Important Features and Benefits of Cisco MWR 2941-DC

Feature	Benefit
Custom-Built for the Cell Site	
Small form factor	• 1-RU/12.5 in. (31.75 cm) deep: chassis preserves limited rack space available at the cell site
Universal DC power supply	• 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	• 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	• Facilitates easy access and at-a-glance activity status
High-Performance Architecture Designed for RAN Aggregation, Optimization, and Transport	
Hardware-accelerated network services	• Provides hardware-accelerated CESoPSN, SAToP, ATM, and EoMPLS • Provides hardware-accelerated MLPPP for up to 16 links • Facilitates ATM segmentation and reassembly (SAR) and IMA • Achieves proven transparency in GSM, UMTS, CDMA, and LTE networks
Line-rate Layer 2 switching	• Provides line-rate switching at Layer 2 and supports hub-spoke redundancy with Flexlink as well as REP for ring-based redundancy
Multiple clocking options	• Allows choices for clocking to match backhaul media and requirements
Cell-Site IP Connectivity	
Optimized RAN transport over IP and IP/MPLS RAN backhaul Cell IP POPs	• 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, and cell-site telemetry
Investment Protection	
Flexible fixed-port and modular architecture	• 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	• Supports a subset of Cisco IOS Software features in common with the Cisco 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 Prime, Cisco ANA and Cisco MWTM	• Allows simplified and scalable network element management, performance monitoring, and advanced statistics reporting • Helps manage both Cisco and third-party devices • Includes domain management support for MPLS and Carrier Ethernet

Product Specifications

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

Table 4. Cisco MWR 2941-DC System Specifications

Description	Specification
Processor types	Cisco IOS Software host processor, network processor, clocking and synchronization complex, integrated Layer 2 switch
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 interfaces	BITS input port, 10-MHz input/output, 1 PPS input/output, Time-of-Day(ToD) interface port, and Synchronous Ethernet (SyncE)
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. (48.26 cm)
Standard components	Front-to-back airflow 1-RU-high chassis Front-panel access cabling and LED indicators

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

Table 5. Cisco MWR 2941-DC Power Specifications

Description	Specification
DC-input power and power dissipation	45W nominal (no HWIC), 65W maximum
DC-input voltage rating	20 to 60 VDC, 27 VDC or -48 VDC nominal, 60 VDC maximum
DC-input current rating	3.25A maximum
Power connector	4 Position Euro Style Connector, A and B DC Power, AMPHENOL ELFP04210, MOLEX 0395300004 (P1 = + A PWR, P2 = -A PWR, P3 = -B PWR, P4 = +B PWR

Table 6 lists the environmental specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 6. Cisco MWR 2941-DC Environmental Specifications

Description	Specification
Operating temperature	-4 to 140℉ (-20 to 60℃)
Nonoperating temperature	-40 to 185℉ (-40 to 85℃)
Relative humidity	5 to 90 percent noncondensing, ±5 percent
Operation altitude	13,800 ft (4000m) maximum 104℉ (40℃) ambient
Noise level	63.5 dBA
Airflow	18 cfm

Table 7 lists the regulatory standards compliance specifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 7. Cisco MWR 2941-DC Regulatory Standards Compliance

Description	Specification
Safety	UL/CUL 60950-1 CAN/CSA-C22.2 No. 60950-1-03 EN 60950-1 IEC 60950-1 AS/NZS 60950.1 CE Marking
EMC	CFR 47 Part 15 (FCC) Class A ICES-003 Class A AS/NZS CISPR 22 Class A CISPR 22 (EN55022) Class A VCCI Class A EN300 386: TNE (EMC) EN55022: ITE (Emissions) EN55024: ITE (Immunity) EN50082-1/EN61000-6-1 CE Marking

Table 8 lists the Cisco and industry certifications for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 8. Cisco MWR 2941-DC Industry Certifications

Description	Industry Group
Certifications	Cisco Validated Design for Carrier Ethernet Transport with IP RAN Backhaul ATCA Telecom EANTC for Mobile Backhaul IP/MPLS Forum for Mobile Backhaul

Table 9 describes the high-speed WAN interface cards (HWICs supported on the Cisco MWR 2941-DC Mobile Wireless Router.

Table 9. Cisco MWR 2941-DC HWICs

WIC and VWIC Part Number	Description
HWIC-4T1/E1	4-port T1/E1 HWIC
HWIC-D-9ESW	9-port 10/100 Ethernet switch interface card

HWIC support is dependent on the Cisco IOS Software release. Please contact your Cisco representative for more information. When deployed within the Cisco MWR-2941-DC, HWICs support an operating temperature range of 14 to 131°F (-10 to 55°C).

Supported SFPs include: SFP-GE-S, SFP-GE-L, SFP-GE-Z, GLC-ZX-SM-RGD, GLC-LX-SM-RGD, GLC-SX-MM-RGD, GLC-BX-D, GLC-BX-U, GLC-EX-SMD and SFP-GE-T. Because additional SFPs are added on an ongoing basis, please refer to the release notes for the latest list.

Ordering Information

Table 10 gives ordering information for the Cisco MWR 2941-DC Mobile Wireless Router.

Table 10. Cisco MWR 2941-DC Mobile Wireless Router

Cisco MWR 2941-DC Part Number	Description
MWR-2941-DC-A	Cisco MWR-2941-DC-A Mobile Wireless Router

| FR-MWR-2941-TOP | Timing over Packet Feature License |

Warranty Information

Find warranty information on Cisco.com at the [Product Warranties](#) page.

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 consolidate their current RANs, reducing operating costs and increasing profit margins. 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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