Cisco MWR 2941-DC Router Overview

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. The router is used at the cell site edge as a part of a 2G, 3G, or 4G radio access network (RAN).

The Cisco MWR 2941-DC helps enable a variety of RAN solutions by extending IP connectivity to devices using Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Node Bs using HSPA or LTE, base transceiver stations (BTSs) using Enhanced Data Rates for GSM Evolution (EDGE), Code Division Multiple Access (CDMA), CDMA-2000, EVDO, or WiMAX, and other 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, Ethernet in the First Mile (EFM), 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.

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.

This chapter includes the following sections:

- Introduction, page 1-1
- Features, page 1-2
- Network Management Features, page 1-13
- Limitations and Restrictions, page 1-14

Introduction

A typical RAN is composed of thousands of base transceiver stations (BTSs)/Node Bs, hundreds of base station controllers/radio network controllers (BSCs/RNCs), and several mobile switching centers (MSCs). The BTS/Node Bs and BSC/RNC are often separated by large geographic distances, with the BTSs/Node Bs located in cell sites uniformly distributed throughout a region, and the BSCs, RNCs, and MSCs located at suitably chosen Central Offices (CO) or mobile telephone switching offices (MTSO).

The traffic generated by a BTS/Node B is transported to the corresponding BSC/RNC across a network, referred to as the backhaul network, which is often a hub-and-spoke topology with hundreds of BTS/Node Bs connected to a BSC/RNC by point-to-point time division multiplexing (TDM) trunks. These TDM trunks may be leased-line T1/E1s or their logical equivalents, such as microwave links or satellite channels.
RAN Transport Solutions

The Cisco MWR 2941-DC Mobile Wireless Router supports a variety of RAN transport solutions, including the following:

- Optimized RAN transport over IP: Maximizes voice and data call density per T1/E1 over the RAN transport network for standards including GSM, GPRS, EDGE, HSPA, and fourth-generation (4G). Optimization helps reduce backhaul transmission costs, which are typically the largest operational expenses in the network.
- IP/Multiprotocol Label Switching (MPLS) RAN backhaul: Allows you to create a high-speed backhaul for a variety of traffic types, including GSM, CDMA, HSPA/LTE, CDMA, EVDO, and WiMAX networks.
- Cell-site operations support networks: Facilitates telemetry to cell sites for remote operations and network element management.
- Cell-site IP points of presence (POPs): Allows you to offer IP services and applications at cell sites.

Features

The following sections describe the features available in the Cisco MWR 2941-DC router.

Cisco Pseudowire Emulation Edge-to-Edge

Cisco Pseudowire Emulation Edge-to-Edge (PWE3) allows you to transport traffic using traditional services such as E1/T1 over a packet-based backhaul technology such as MPLS or IP. A pseudowire (PW) consists of a connection between two provider edge (PE) devices that connects two attachment circuits (ACs), such as ATM VPIs/VCLs or E1/T1 links.

Figure 1-1  Cisco MWR 2941-DC Router in a PWE3—Example

PWs manage encapsulation, timing, order, and other operations in order to make it transparent to users; the PW tunnel appears as an unshared link or circuit of the emulated service.

There are limitations that impede some applications from utilizing a PW connection. For more information, see the section describing the PW service.
Cisco supports the following standards-based PWE types:

- **Structure-agnostic TDM over Packet**, page 1-3
- **Structure-aware TDM Circuit Emulation Service over Packet-Switched Network**, page 1-3
- **Transportation of Service Using ATM over MPLS**, page 1-3
- **Transportation of Service Using Ethernet over MPLS**, page 1-4

### Structure-agnostic TDM over Packet

SAToP encapsulates TDM bit-streams (T1, E1, T3, E3) as PWs over PSNs. It disregards any structure that may be imposed on streams, in particular the structure imposed by the standard TDM framing.

The protocol used for emulation of these services does not depend on the method in which attachment circuits are delivered to the PEs. For example, a T1 attachment circuit is treated the same way for all delivery methods, including: PE on copper, multiplex in a T3 circuit, mapped into a virtual tributary of a SONET/SDH circuit, or carried over a network using unstructured Circuit Emulation Service (CES). Termination of specific carrier layers used between the PE and circuit emulation (CE) is performed by an appropriate network service provider (NSP).

For instructions on how to configure SAToP, see Configuring Structure-Agnostic TDM over Packet (SAToP), page 4-38. For a sample SAToP configuration, see TDM over MPLS Configuration, page A-15.

### Structure-aware TDM Circuit Emulation Service over Packet-Switched Network

CESoPSN encapsulates structured (NxDS0) TDM signals as PWs over PSNs. It complements similar work for structure-agnostic emulation of TDM bit-streams, such as PWE3-SAToP.

Emulation of NxDS0 circuits saves PSN bandwidth and supports DS0-level grooming and distributed cross-connect applications. It also enhances resilience of CE devices due to the effects of loss of packets in the PSN.

CESoPSN supports channel-associated signaling (CAS) for E1 and T1 interfaces. CAS provides signaling information within each DS0 channel as opposed to using a separate signaling channel. CAS also referred to as in-band signaling or robbed bit signaling.

For instructions on how to configure SAToP, see Configuring Circuit Emulation Service over Packet-Switched Network (CESoPSN), page 4-39. For a sample SAToP configuration, see TDM over MPLS Configuration, page A-15.

### Transportation of Service Using ATM over MPLS

An Asynchronous Transfer Mode (ATM) over MPLS PW is used to carry ATM cells over an MPLS network. It is an evolutionary technology that allows you to migrate packet networks from legacy networks, yet provides transport for legacy applications. ATM over MPLS is particularly useful for transporting 3G voice traffic over MPLS networks.

You can configure ATM over MPLS in the following modes:

- **N-to-1 Cell Mode**—Maps one or more ATM virtual channel connections (VCCs) or virtual permanent connection (VPCs) to a single pseudowire.
- **1-to-1 Cell Mode**—Maps a single ATM VCC or VPC to a single pseudowire.
- **Port Mode**—Map one physical port to a single pseudowire connection.
The Cisco MWR 2941-DC also supports cell packing and PVC mapping for ATM over MPLS pseudowires.

For more information about how to configure ATM over MPLS, see “Configuring Transportation of Service Using ATM over MPLS” section on page 4-40. For sample ATM over MPLS configurations, see “ATM over MPLS Configuration” section on page A-18.

**Transportation of Service Using Ethernet over MPLS**

Ethernet over MPLS (EoMPLS) PWs provide a tunneling mechanism for Ethernet traffic through an MPLS-enabled Layer 3 core network. EoMPLS PWs encapsulate Ethernet protocol data units (PDUs) inside MPLS packets and use label switching to forward them across an MPLS network. EoMPLS PWs are an evolutionary technology that allows you to migrate packet networks from legacy networks while providing transport for legacy applications. EoMPLS PWs also simplify provisioning, since the provider edge equipment only requires Layer 2 connectivity to the connected customer edge (CE) equipment. The Cisco MWR 2941-DC implementation of EoMPLS PWs is compliant with the RFC 4447 and 4448 standards.

For instructions on how to create an EoMPLS PW, see Configuring Transportation of Service Using Ethernet over MPLS, page 4-46.

**Limitations**

When configuring an EoMPLS pseudowire on the Cisco MWR 2941-DC, you cannot configure an IP address on the same interface as the pseudowire.

**Generic Routing Encapsulation (GRE) Tunneling**

Generic routing encapsulation (GRE) is a tunneling protocol developed by Cisco that can encapsulate a wide variety of protocol packet types inside IP tunnels, creating a virtual point-to-point link to Cisco routers at remote points over an IP internetwork. GRE tunneling allows you to transport a pseudowire over an IP backhaul network when MPLS routing is not available between a cell site (BTS or Node-B) and an aggregation point (BSC or RNC). The Cisco MWR 2941-DC supports GRE encapsulation for the following PW connection types:

- ATM over MPLS
- SAToP
- CESoPSN
- Ethernet over MPLS

The Cisco MWR 2941-DC implementation of GRE can interoperate with the Cisco 7600 router and provides compliance with RFCs 2784 and 4023. The Cisco MWR 2941-DC supports up to 128 GRE tunnels. For more information about how to configure GRE tunneling, see Configuring GRE Tunneling, page 4-36.

**GSM Abis Optimization over IP Implementation**

GSM Abis refers to the interface between the BTS and BSC in GSM system (the same term is used for CDMA systems). The Cisco MWR 2941-DC implementation of GSM Abis optimization over IP allows carriers to optimize voice and data traffic and maximize effective utilization of E1/T1 backhaul connections. Figure 1-2 shows a Cisco MWR 2941-DC router in a network using GSM Abis Optimization over IP.
The Cisco GSM Abis optimization solution increases the T1/E1 bandwidth efficiency by as much as 50 percent:

1. Traffic loads can be carried using half as many T1/E1 trunks as previously used, allowing more voice and data calls to be carried over the existing RAN backhaul network.
2. The need to add new T1/E1 trunks is eliminated as traffic demands grow.
3. Existing trunks can be decommissioned (ending recurring costs).

Excess capacity is available in the existing RAN backhaul network. The operator can reallocate recovered bandwidth to carry traffic from other radios, such as GPRS, EDGE, 1xEV-DO, PWLANs, and other data overlays. The operator avoids costs of supplementing backhaul capacity. It also accelerates time to revenue from deployments of new radio technologies, as there is no need for the operator to be delayed until additional microwave licenses or leased-lines are supplied.

The Cisco MWR 2941-DC complies with 3GPP2 and 3GPP R5 and R6 transport standards. Cisco converts CDMA transport networks into 3GPP2-compliant IP RAN transport networks, and GSM transport networks into R5/R6 IP RAN transport networks—and adds multiradio backhaul compression. Mobile wireless operators can leverage the benefits of IP transport in GSM RANs.
## Clocking and Timing

The following sections describe the clocking and timing features available on the Cisco MWR 2941-DC.

- **Network Clocking Overview**
- **Precision Timing Protocol (PTP)**
- **Pseudowire-based Clocking**
- **Synchronous Ethernet**
- **Network Timing Reference**

### Network Clocking Overview

Clock synchronization is important for a variety of applications, including synchronization of radio cell towers. While legacy TDM protocols incorporate timing features, packet-switched networks such as Ethernet do not natively include these features. The Cisco MWR 2941-DC supports legacy TDM technologies while supporting a variety of technologies that distribute clocking information over packet-switched networks.

Clocking is typically distributed from the core network outward to the BTS or Node B at the network edge. The Cisco MWR 2941-DC receives and transmits clocking information using any of the following ports:

- T1/E1
- Ethernet (GigabitEthernet and FastEthernet ports)
- DSL
- BITS/SYNC port

**Note**

The Cisco MWR 2941-DC does not support clocking and timing on the HWIC-D-9ESW and HWIC-1GE-SFP cards.

### Precision Timing Protocol (PTP)

The Cisco MWR 2941-DC supports the Precision Time Protocol (PTP) as defined by the IEEE 1588-2008 standard. PTP provides for accurate time synchronization on over packet-switched networks. Nodes within a PTP network can act in one of the following roles:

- **Grandmaster**—A device on the network physically attached to the primary time source. All other clocks are ultimately synchronized to the grandmaster clock.
- **Ordinary clock**—An ordinary clock is a 1588 clock with a single PTP port that can serve in one of the following roles:
  - **Master mode**—Distributes timing information over the network to one or more slave clocks, thus allowing the slave to synchronize its clock to the master.
  - **Slave mode**—Synchronizes its clock to a master clock.
- **Boundary clock**—The device participates in selecting the best master clock and can act as the master clock if no better clocks are detected.
- **Transparent clock**—A device such as a switch that calculates the time it requires to forward traffic and updates the PTP time correction field to account for the delay, making the device transparent in terms of timing calculations.
Note
The Cisco MWR 2941-DC does not currently act as a boundary clock or a transparent clock.

Note
The 1588-2008 standard defines other clocking devices that are not described here.

PTP Domains

PTP devices use a best master clock algorithm to determine the most accurate clock on a network and construct a clocking hierarchy based on the grandmaster clock. A given clocking hierarchy is called a PTP domain.

Clock synchronization

PTP master devices periodically launch an exchange of messages with slave devices to help each slave clock recompute the offset between its clock and the master clock. Periodic clock synchronization mitigates any drift between the master and slave clocks.

PTP Redundancy

The Cisco MWR 2941-DC supports the multicast- and unicast-based timing as specified in the 1588-2008 standard. The Cisco MWR 2941-DC can use multicast routing to establish redundant paths between an external PTP client and one or more PTP multicast master clocks. The Cisco MWR 2941-DC functions as a multicast router only for PTP traffic and only allows multicast traffic to pass from the PTP master clocks to the PTP client (the PTP client can send unicast traffic).

When configured as a multicast PTP router, the Cisco MWR 2941-DC selects the best path toward a Rendezvous Point (RP) using the active routing protocol, sends a Cisco Protocol Independent Multicast (PIM) join message to the RP, and forwards PTP multicast messages to the PTP client. The Cisco MWR 2941-DC also supports PIM forwarding. For instructions on how to configure PTP redundancy using multicast, see Configuring PTP Redundancy, page 4-22.

Pseudowire-based Clocking

Pseudowire-based clocking allows the Cisco MWR 2941-DC router to

- Transmit and receive clocking information over a pseudowire interface
- Receive clocking over a virtual pseudowire interface.

The Cisco MWR 2941-DC can transmit clocking information within packet headers (in-band) or as a separate packet stream (out-of-band).

Pseudowire-based clocking also supports adaptive clock recovery (ACR), which allows the Cisco MWR 2941-DC to recover clocking from the headers of a packet stream. For instructions on how to configure pseudowire-based clocking, see Configuring Clocking and Timing, page 4-15. For more information about using pseudowires, see Cisco Pseudowire Emulation Edge-to-Edge, page 1-2.

Synchronous Ethernet

Synchronous ethernet is a timing technology that allows the Cisco MWR 2941-DC to transport frequency and time information over Ethernet. To configure synchronous Ethernet, see Configuring Clocking and Timing, page 4-15.
Network Timing Reference

Network Timing Reference (NTR) is a highly accurate method of distributing frequency and clocking over DSL networks; it allows the Cisco MWR 2941-DC to exchange frequency and clocking information over a DSL connection. For instructions on how to configure NTR, see Configuring Clocking and Timing, page 4-15.

Routing Protocols

In addition to static routing, the Cisco MWR 2941-DC supports the following dynamic routing protocols:

- OSPF—An Interior Gateway Protocol (IGP) designed expressly for IP networks that supports IP subnetting and tagging of externally derived routing information. OSPF also allows packet authentication and uses IP multicast when sending and receiving packets.
- IS-IS—An Open System Interconnection (OSI) protocol that specifies how routers communicate with routers in different domains.
- BGP—An interdomain routing protocol designed to provide loop-free routing between separate routing domains that contain independent routing policies (autonomous systems).

For instructions on how to configure routing on the Cisco MWR 2941-DC, see Configuring Routing Protocols, page 4-59.

Bidirectional Forwarding Detection

Bidirectional Forwarding Detection (BFD) provides a low-overhead, short-duration method of detecting failures in the forwarding path between two adjacent routers, including the interfaces, data links, and forwarding planes. BFD is a detection protocol that you enable at the interface and routing protocol levels. For instructions on how to configure BFD, see the “Configuring BFD” section on page 4-60.

MLPPP Optimization Features

The Cisco MWR 2941-DC supports several features that improve the performance of Multilink Point-to-Point Protocol (MLPPP) connections and related applications such as PWE3 over MLPPP, IP over MLPPP, and GSMmux over MLPPP.

Distributed IP Header Compression Offload

Distributed IP Header Compression (dIPHC) allows the MWR 2941 to compress IP packet headers for more efficient use of bandwidth. Release 12.4(20)MR improves dIPHC performance by shifting processing from the main CPU to the network processor. The MWR 2941 supports dIPHC for GSM-Abis traffic and decompression for TCP and non-TCP packet streams as defined by RFC 2507. The MWR 2941 supports dIPHC offload for up to 24 E1 or T1 connections.
Distributed Multilink Point-to-Point Protocol (dMLPPP) Offload

Distributed Multilink Point-to-Point Protocol (dMLPPP) allows you to combine T1 or E1 connections into a bundle that has the combined bandwidth of all of the connections in the bundle, providing improved capacity and CPU utilization over MLPPP. The dMLPPP offload feature improves the performance for traffic in dMLPPP applications such as PWE3 over MLPPP, IP over MLPPP, and GSMmux over MLPPP by shifting processing of this traffic from the main CPU to the network processor.

The Cisco MWR 2941-DC supports up to four serial links per T1/E1 connection and up to 24 MLPPP bundles. You can use the fixed T1/E1 ports to create up to 64 MLPPP links; if you install two four-port T1/E1 HWICs, you can create up to 96 MLPPP links.

The MWR 2941 implementation of multilink (dMLPPP) uses interleaving to allow short, delay-sensitive packets to be transmitted within a predictable amount of time. Interleaving allows the MWR 2941 to interrupt the transmission of delay-insensitive packets in order to transmit delay-sensitive packets. You can also adjust the responsiveness of the MWR 2941 to delay-sensitive traffic by adjusting the maximum fragment size; this value determines the maximum delay that a delay-sensitive packet can encounter while the MWR 2941 transmits queued fragments of delay-insensitive traffic.

Multiclass MLPPP

The MWR 2941 implementation of dMLPPP also supports Multiclass MLPPP. Multiclass MLPPP is an extension to MLPPP functionality that allows you to divide traffic passing over a multilink bundle into several independently sequenced streams or classes. Each multiclass MLPPP class has a unique sequence number, and the receiving network peer processes each stream independently. The multiclass MLPPP standard is defined in RFC 2686.

The MWR 2941 supports the following multiclass MLPPP classes:

- Class 0 - Data traffic that is subject to normal MLPPP fragmentation. Appropriate for non-delay-sensitive traffic.
- Class 1 - Data traffic that can be interleaved but not fragmented. Appropriate for delay-sensitive traffic such as voice.

For instructions on how to configure MLPPP backhaul, see Configuring MLPPP Backhaul, page 4-47.

Note

The Cisco MWR 2941-DC does not support some PPP and MLPPP options when the bundle is offloaded to the network processor; you can retain these options by disabling MLPPP and IPHC offloading for a given bundle. For more information, see MLPPP and IPHC Offload, page 4-55.

Note

The output for the show ppp multilink command for an offloaded MLPPP bundle differs from the output for a non-offloaded bundle. For more information, see Appendix B, "Cisco MWR 2941-DC Router Command Reference."

Layer 3 Virtual Private Networks (VPNs)

A Virtual Private Network (VPN) is an IP-based network that delivers private network services over a public infrastructure. VPNs allow you to create a set of sites that can communicate privately over the Internet or other public or private networks.
A conventional VPN consists of a full mesh of tunnels or permanent virtual circuits (PVCs) connecting all of the sites within the VPN. This type of VPN requires changes to each edge device in the VPN in order to add a new site. Layer 3 VPNs are easier to manage and expand than conventional VPNs because they use layer 3 communication protocols and are based on a peer model. The peer model enables the service provider and customer to exchange Layer 3 routing information, enabling service providers to relay data between customer sites without customer involvement. The peer model also provides improved security of data transmission between VPN sites because data is isolated between improves security between VPN sites.

The Cisco MWR 2941-DC supports the following MPLS VPN types:

- **Basic Layer 3 VPN**—Provides a VPN private tunnel connection between customer edge (CE) devices in the service provider network. The provider edge (PE) router uses Multiprotocol Border Gateway Protocol (MP-BGP) to distribute VPN routes and MPLS Label Distribution Protocol (LDP) to distribute Interior Gateway Protocol (IGP) labels to the next-hop PE router.

- **MPLS Carrier Supporting Carrier (CSC) VPN**—Enables an MPLS VPN-based service provider to allow other service providers to use a segment of its backbone network. MPLS CSC VPNs use MPLS LDP to distribute MPLS labels and IGP to distribute routes.

- **Inter-Autonomous System (AS) VPN**—An inter-AS VPN allows service providers running separate networks to jointly offer MPLS VPN services to the same end customer; an inter-AS VPN can begin at one customer site and traverse multiple service provider backbones before arriving at another customer site.

For instructions on how to configure an layer 3 VPN, see Layer 3 Virtual Private Networks (VPNs), page 1-9.

### Intelligent Cell Site IP Services

The Cisco RAN-O and IP-RAN solutions allow you to deliver profit-enhancing services. This is achieved through the set of IP networking features supported in Cisco IOS software that extends to the cell site (see Figure 1-3 on page 1-11).

### Cell Site Points-of-Presence

The cell site becomes a physical Point-of-Presence (POP) from which to offer hotspot services, or voice and wired ISP services, to nearby enterprises and residences. Because many cell sites are located in and around downtown areas, hotels, airports, and convention centers, they make attractive sites for co-locating public wireless LAN (PWLAN) access points and other wireless data overlays. Many of these wireless data radios are IP-based. IP networking features, like Mobile IP, VoIP, IP Multicast, VPN, and content caching, enable delivery of new revenue-generating services over these radios. The corresponding traffic “rides for free” on the spare backhaul bandwidth made available by Cisco Abis optimization solutions (Figure 1-3).
RAN-Optimization Implementation

In RAN-Optimization (RAN-O), the Cisco MWR 2941-DC router extends IP connectivity to the cell site and base transceiver station (BTS). The router provides bandwidth-efficient IP transport of GSM and UMTS voice and data bearer traffic, as well as maintenance, control, and signaling traffic, over the leased-line backhaul network between the BTS and leased-line termination and aggregation node through compression (cRTP/cUDP) and packet multiplexing (Multilink PPP).

Quality of Service (QoS)

This section describes the Quality of Service (QoS) features on the Cisco MWR 2941-DC. The Cisco MWR 2941-DC supports the following QoS features.

- Traffic Classification
- Traffic Marking
- Traffic Queuing
- Traffic Shaping
Features

Note

The Cisco MWR 2941-DC support for QoS varies based on the interface and traffic type. For more information about the QoS limitations, see Configuring Quality of Service (QoS), page 4-64.

For instructions on how to configure QoS on the Cisco MWR 2941-DC, see Configuring Quality of Service (QoS), page 4-64.

Traffic Classification

Classifying network traffic allows you to organize packets into traffic classes based on whether the traffic matches specific criteria. Classifying network traffic is the foundation for enabling many QoS features on your network. For instructions on how to configure traffic classification, see Configuring Classification, page 4-71.

Traffic Marking

Marking network traffic allows you to set or modify the attributes for packets in a defined traffic class. You can use marking with traffic classification to configure variety of QoS features for your network. For instructions on how to configure traffic marking, see Configuring Marking, page 4-73.

Traffic Queuing

The Cisco MWR 2941-DC supports class-based WFQ (CBWFQ) for congestion management. CBWFQ extends the standard WFQ functionality to provide support for user-defined traffic classes. For CBWFQ, you define traffic classes based on match criteria including protocols, access control lists (ACLs), and input interfaces. Packets satisfying the match criteria for a class constitute the traffic for that class. For more instructions on how to configure traffic queuing, see Configuring Congestion Management, page 4-76.

Traffic Shaping

Regulating the packet flow on the network is also known as traffic shaping. Traffic shaping allows you to control the speed of traffic leaving an interface. This way, you can match the flow of the traffic to the speed of the interface receiving the packet.

The Cisco MWR 2941-DC supports Class-Based Traffic Shaping. Class-Based Traffic Shaping allows you to regulate the flow of packets leaving an interface on a per-traffic-class basis, matching the packet flow to the speed of the interface. For more instructions on how to configure traffic shaping, see Configuring Shaping, page 4-78.

ATM Classes of Service (CoS)

The Cisco MWR 2941-DC supports the following ATM classes of service (CoS):

- Unspecified Bit Rate (UBR)—A QoS class that allows devices to send any amount of data up to a specified maximum across the network but provides no guarantees for cell loss rate or delay. You can apply this QoS type to an ATM PVC, SVC, VC class, or VC bundle member.
- Non-Real Time Variable Bit Rate (VBR-NRT)—A QoS class used for connections in which there is no fixed timing relationship between samples but that still need a guaranteed QoS.
Network Management Features

This section provides an overview of the network management features for the Cisco MWR 2941-DC. For more information about management features on the Cisco MWR 2941-DC, see “Monitoring and Managing the Cisco MWR 2941-DC Router” section on page 4-86.

Cisco Mobile Wireless Transport Manager (MWTM)

You can use Cisco Mobile Wireless Transport Manager (MWTM), to monitor and manage the Cisco MWR 2941-DC. Cisco MWTM addresses the element-management requirements of mobile operators and provides fault, configuration, and troubleshooting capability. For more information about MWTM, see http://www.cisco.com/en/US/products/ps6472/tsd_products_support_series_home.html.

Cisco Active Network Abstraction (ANA)

You can also use Cisco Active Network Abstraction (ANA) to manage the Cisco MWR 2941-DC. Cisco ANA is a powerful, next-generation network resource management solution designed with a fully distributed OSS mediation platform which abstracts the network, its topology and its capabilities from the physical elements. Its virtual nature provides customers with a strong and reliable platform for service activation, service assurance and network management. For more information about ANA, see http://www.cisco.com/en/US/products/ps6776/tsd_products_support_series_home.html.

SNMP MIB Support

To view the current MIBs that the Cisco MWR 2941-DC supports, see the Release Notes for Cisco MWR 2941-DC Mobile Wireless Edge Router for Cisco IOS Release 12.4(20)MRA.

For instructions on how to configure MIBs on the Cisco MWR 2941-DC, see Configuring SNMP Support, page 4-87 and Enabling Remote Network Management, page 4-90.

Cisco Networking Services (CNS)

Cisco Networking Services (CNS) is a collection of services that can provide remote configuration of Cisco IOS networking devices and remote execution of some command-line interface (CLI) commands. CNS allows a Cisco MWR 2941-DC deployed and powered on in the field to automatically download its configuration.

Note

The Cisco MWR 2941-DC only supports CNS over motherboard Ethernet interfaces. Other interface types do not support CNS.
For instructions on how to configure CNS, see Configuring Cisco Networking Services (CNS), page 4-93.

Limitations and Restrictions

The following sections describe the limitations and restrictions that apply to the Cisco MWR 2941-DC router.

Hardware Limitations and Restrictions

To view a list of supported hardware and restrictions for the Cisco MWR 2941-DC, see the Release Notes for Cisco MWR 2941-DC Mobile Wireless Edge Router for Cisco IOS Release 12.4(20)MRA.

⚠️ Caution
The Cisco MWR 2941-DC does not support online insertion and removal (OIR) of HWIC cards. Attempts to perform OIR on a card in a powered-on router might cause damage to the card.

Software Limitations and Restrictions

For information about software limitations and restrictions for the Cisco MWR 2941-DC, see the Release Notes for Cisco MWR 2941-DC Mobile Wireless Edge Router for Cisco IOS Release 12.4(20)MRA.