

在URWB模式的IW接入点上配置第3层流量并排除故障

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简介

本文档介绍CURWB设备的第3层流动设置配置，并提供排除网络故障的实际指导。

目标是确保无缝的设置流程，并为您提供有效解决潜在问题的工具。

使用的组件

本文档中详述的配置涉及以下硬件组件：

- 思科Catalyst IW9167

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

什么是流动性？

在CURWB（思科超可靠无线回程）环境中，Fluidity是一种基于多协议标签交换(MPLS)技术的网络架构，旨在高效地提供IP封装的数据。

在CURWB移动网络中，当现有链路中断并建立新链路时，将会发生切换过程。这种切换类似于网络拓扑更改，在高速移动场景中是一个关键挑战。

传统的检测此类更改和重新配置节点的机制通常速度太慢，而且需要大量数据，导致性能不佳。

为了克服这些限制，Fluidity引入了快速切换解决方案，该解决方案提供低至1毫秒延迟的快速路径重新配置。T

此机制通过扩展网络的控制平面并利用针对节点MPLS转发信息库(FIB)表的专用操作技术，提高了高移动性场景下的实时性能。

在Fluidity架构中，移动节点在相互检测时动态建立与轨道侧无线电的伪线。

当车辆沿轨道移动时，它基于预定义的流动参数启动从一个轨道侧无线电设备到另一个轨道侧无线电设备的切换，从而确保无缝连接和最佳性能

需要第3层流动性

第3层流动性提供了一系列功能，可应对多网络环境中的移动性挑战。主要优势包括：

1. 跨子网的无缝切换

第3层使车辆能够在轨旁基站或属于不同子网的无线电之间无缝过渡。

2. L2TP隧道集成

这种无缝连接是通过使用第2层隧道协议(L2TP)隧道实现的。这些隧道将每个网络集群或站点的网状端连接到位于网络核心的集中式Fluidmesh网关设备，称为全局网关。

3. 集中式MPLS路由

每个全局网关在每个网络集群或子网与网状端建立L2TP隧道。此配置允许MPLS路由在全局网关进行，无需在每个子网进行常规第3层路由。

4. 切换期间的不间断连接

利用第3层流动性，车辆可以在多个轨道侧网络集群之间移动，每个集群属于不同的网络或子网，而不会丢失与核心网络的端到端连接，即使在切换期间也是如此。

5. 跨广域部署的可扩展性

第3层流动性旨在跨多个网络部署和站点进行扩展，即使这些站点相距很远。无论站点是通过专用光纤链路连接还是通过公共域基础设施（如ISP）连接，它都可以无缝工作。

6. 实现无缝路由的子网拼合

第3层流动性在现有网络基础设施之上，使用L2TP封装“拼合”子网。这些封装为跨多个网络（一直到核心网络）移动的车辆建立无缝路由和端到端连接。

第3层流动性主要概念

- 轨道侧子网和全局网关网络之间的通信依赖于客户路由的IP网络，而与车辆网络的连接则通过MPLS和L2TP隧道建立。
- 每个轨道边无线网络至少需要一个网状端，网络位于单独的广播域中。
- 每个全局网关必须连接到每个网状网端的L2TP WAN地址
- 车载的CURWB无线电必须具有每个本地子网的静态路由，从而能够向全局网关通告地址以实现网络融合。
- 车载路由器的IP地址必须设置为车辆无线电的默认网关

第3层流动性的网络拓扑

本文档概述了思科超可靠无线回程(CURWB)第3层网络设计的架构。

这种稳健的拓扑结构设计用于促进移动车辆与固定轨道边基础设施之间的无缝可靠通信，最终将数据集成到集中式企业网络中。

该设计利用第3层路由对网络进行逻辑分段，确保不同运营域之间的高效数据流和可扩展性。

汽车分部：每个“车辆”都配备一个板载路由器、一个板载交换机、板载服务器和两个IW9167设备，提供关键硬件冗余。

板载路由器充当车辆内部网络的主要网关，连接到板载交换机，进而促进连接IW9167设备和板载服务器。

轨道端子网：基础设施包括多个“跟踪端子网”（例如，跟踪端子网A、跟踪端子网n），每个子网包含各种IW9167无线电，包括网状终端设备和网状点设备。

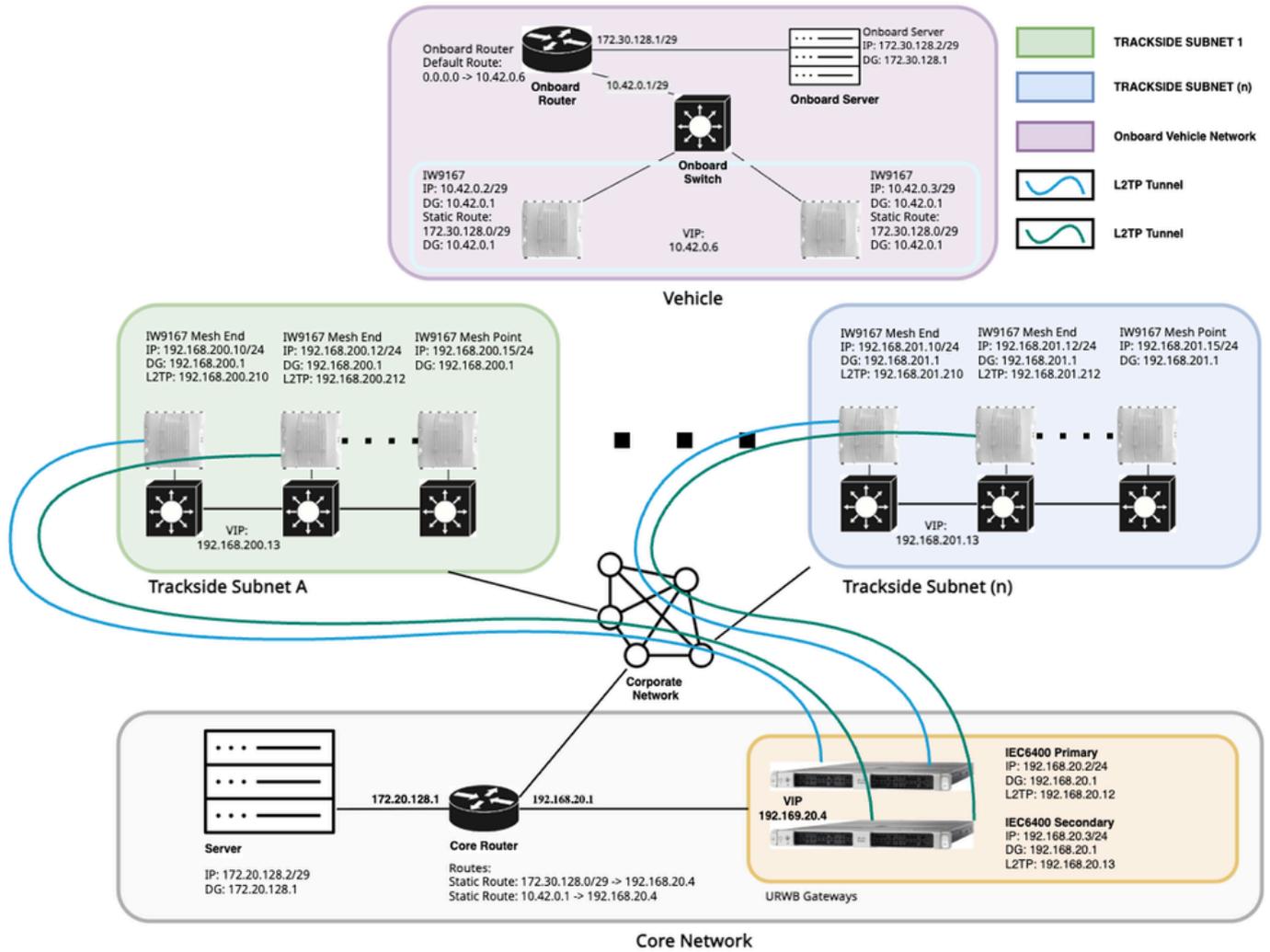
每个跟踪端子网在其入口/出口点设计有两个网状终端设备，实现硬件冗余的“快速失败”功能。

此设置允许每个子网部分代表不同的地理区域，使车辆在这些区域之间无缝漫游，同时保持与公司

网络的持续连接。

企业网络:此中心网络充当主干，连接到所有轨道端子网并容纳核心基础设施。它包括核心服务器、核心路由器和冗余URWB网关（主要和辅助IEC6400设备）。

核心路由器负责汇聚来自各种轨道边子网的流量并管理静态路由，以确保企业网络与车辆和轨道边网段之间的高效通信。



网络IP配置摘要

组件/设备	IP Address	子网	默认网关	L2TP地址	备注
车辆段					
板载 IW9167(1)	10.42.0.2	255.255.255.248	10.42.0.1	不适用	静态路由 172.30.128.0/29 > 10.42.0.1

板载 IW9167(2)	10.42.0.3	255.255.255.248	10.42.0.1	不适用	VIP:10.42.0.6
板载服务器	172.30.128.2	255.255.255.248	172.30.128.1	不适用	
板载路由器 IW接口	10.42.0.1	255.255.255.248			默认路由 : 0.0.0.0 -> 10.42.0.6
板载路由器 网络接口	172.30.128.1	255.255.255.248			
轨道边网段 (子网A)					
网状终端 IW9167(1)	192.168.200.10	255.255.255.0	192.168.200.1	192.168.200.210	VIP 192.168.200.13
网状终端 IW9167(2)	192.168.200.12	255.255.255.0	192.168.200.1	192.168.200.212	
网状点 IW9167	192.168.200.15	255.255.255.0	192.168.200.1		
轨道边网段 (子网B)					
网状终端 IW9167(1)	192.168.201.10	255.255.255.0	192.168.201.1	192.168.201.210	VIP 192.168.201.13
网状终端 IW9167(2)	192.168.201.12	255.255.255.0	192.168.201.1	192.168.201.212	
网状点 IW9167	192.168.201.15	255.255.255.0	192.168.201.1		
核心网段					
网关	192.168.20.2	255.255.255.0	192.168.20.1	192.168.20.12	VIP 192.168.20.4

IEC6400(1)					
网关 IEC6400(1)	192.168.20.3	255.255.255.0	192.168.20.1	192.168.20.13	
核心路由器 网关接口	192.168.20.1	255.255.255.0			静态路由 : 172.30.128.0/29 -> 192.168.20.4 静态路由 : 10.42.0.1 -> 192.168.20.4
核心路由器 跟踪端子网 A接口	192.168.200.1	255.255.255.0			
核心路由器 跟踪端子网 n接口	192.168.201.1	255.255.255.0			
核心路由器 服务器接口	172.20.128.2	255.255.255.248	172.20.128.1		

配置第3层流动性

本文档介绍基本的第3层配置，仅重点介绍在核心网络和车辆网络之间建立连接所需的基本设置。本概述中不包括非基本配置和高级功能。

此配置遵循在全局网关、本地网状端和车辆无线电上合并硬件冗余(FastFail)的设计，并假设FastFail已配置。

请注意，无法通过GUI配置MPLS FastFail(HA)和VIP，需要使用CLI或IW服务。有关MPLS FastFail配置的详细指导，请参阅本文档：

<https://www.cisco.com/c/en/us/support/docs/wireless/ultra-reliable-wireless-backhaul/222196-configure-and-troubleshoot-titan-with-cu.html>

无线电配置：

通过GUI配置第3层流动性：

配置全局网关：

1. GENERAL SETTINGS > General Mode:

IEC6400配置为全局网关时，可作为CURWB第3层网络的入口和出口点，实现核心到车辆连接。

IEC6400的网关操作在Fluidity页面上配置。

相反，当IW9167等设备用作第3层网络的全局网关时，在General Mode页面上需要显式网关配置。此外，在网关模式下配置IW无线电会禁用无线接口，因此无线电关闭模式必须设置为Fluidity。

对于IEC-6400，密码在General Mode页面配置，而对于其他无线电，密码在Wireless Radio页面设置。必须对所有轨道边和车辆设备使用相同的密码以确保连接。

必须根据需要配置设备的本地IP、本地网络掩码和默认网关。

2. ADVANCED SETTINGS > I2tp configuration:

在L2TP配置页面上，将同一子网内的L2TP WAN IP地址分配给网关，并指定WAN网关作为此子网的网关。本地UDP端口必须配置为5701。

The screenshot displays the Cisco URWB IEC-6400-URWB Configurator interface. The top header includes the Cisco logo, the device name 'Cisco URWB IEC-6400-URWB Configurator', the IP address '5.69.163.198 - MESH END MODE', and the date 'Sun 22 Jun 2025 12:15:25 PM HST'. A notification bar at the top right states 'Configuration contains changes. Apply these changes?' with buttons for 'Discard', 'Review', and 'Apply & Reboot'.

The left sidebar contains a navigation menu with sections: IOTOD IW (Offline), IW MONITOR (Disabled), and QUADRO. Under 'ADVANCED SETTINGS', the 'l2tp configuration' option is highlighted with a blue arrow. Other options include 'static routes', 'allowlist / blocklist', 'multicast', 'snmp', 'radius', 'ntp', 'ethernet filter', 'vlan settings', 'Fluidity', 'misc settings', 'smart license', 'remote access', 'status', 'configuration settings', 'local certificate', 'reset factory default', 'reboot', and 'logout'.

The main content area is titled 'L2TP Configuration' and is divided into 'Local Unit Configuration' and 'L2TP Tunnels'.

Local Unit Configuration

WAN IP Address is local WAN IP address used for externally communicating with the remote tunnel peers. This address must be reachable from the external hosts, e.g. using port forwarding on the LAN gateway. WAN gateway is the local gateway used by the local unit to communicate with the outside world. Local UDP Port is the port used by remote peers to communicate with the local unit (0 means IP encapsulation).

L2TP

WAN IP Address	WAN Netmask	WAN Gateway	Local UDP Port
192.168.20.12	255.255.255.0	192.168.20.1	5701

Max number of L2TP tunnels: 10

Buttons: Cancel, Save

L2TP Tunnels

L2TP Tunnels currently installed.

Remote IP Address	Remote UDP Port	Status	
192.168.200.210	5701	IDLE	del

Add a New L2TP Tunnel

Remote WAN IP address corresponds to the WAN IP address of the REMOTE unit. Remote UDP port is the port number of the REMOTE unit (0 means IP encapsulation).

Remote WAN IP Address	Remote UDP Port	
<input type="text"/>	<input type="text"/>	Add

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3. ADVANCED SETTINGS > Fluidity:

在“流动性”页面上，必须启用“流动性”模式。IEC6400设备角色只能配置为基础设施。对于第3层操作，网络类型必须设置为多个子网，并且必须选择Global Gateway选项。



ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IEC-6400-URWB Configurator

5.69.163.198 - MESH END MODE

Sun 22 Jun 2025 12:46:51 PM HST

IOTOD IW Offline

IW MONITOR Disabled

QUADRO

GENERAL SETTINGS

- general mode

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- ethernet filter
- i2tp configuration
- vlan settings
- Fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- status
- configuration settings
- local certificate
- reset factory default
- reboot
- logout

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.
 The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.
 The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.
 The Network Type filed must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Fluidity Enable

Unit Role:

Network Type:

Enable Global Gateway:

Reset

Save

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配置跟踪端无线电

1. GENERAL SETTINGS > General Mode:

接下来需要配置轨道侧无线电。轨旁无线电可以跨越多个子网，同一子网下的无线电形成一个集群。每个集群都必须包含专用网状终端无线电，它用作CURWB无线电子网的入口和出口点。可以配置一个或两个网状终端，具体取决于是否需要高可用性(HA)。必须将子网内的其余轨道端无线电配置为网状点。

必须根据需要配置设备的本地IP、本地网络掩码和默认网关。

IW Service Offline
IW Monitor Enabled
QUADRO

- GENERAL SETTINGS
- **general mode**
 - wireless radio
 - antenna alignment and stats
- NETWORK CONTROL
- advanced tools
- ADVANCED SETTINGS
- advanced radio settings
 - static routes
 - allowlist / blocklist
 - multicast
 - snmp
 - radius
 - ntp
 - ethernet filter
 - l2tp configuration
 - vlan settings
 - Fluidity
 - misc settings
 - smart license
- MANAGEMENT SETTINGS
- remote access
 - firmware upgrade
 - status
 - configuration settings
 - reset factory default
 - reboot
 - logout

GENERAL MODE

General Mode

Select MESH END mode if you are installing this Cisco Catalyst IW9167E Heavy Duty Access Point at the head end and connecting this unit to a wired network (i.e. LAN).

mesh point
Mode: mesh end
 gateway

Radio-off:

LAN Parameters

Local IP:

Local Netmask:

Default Gateway:

Local Dns 1:

Local Dns 2:

Enable IPv6:

Reset

Save

2. GENERAL SETTINGS > Wireless Radio:

在Wireless Radio页面上，必须使用与其他所有无线电相同的密码。无线接口的无线电角色必须配置为Fluidity。虽然可以根据项目要求将多个无线接口用于无线电，但为了简单起见，本实验设置中仅配置了Radio 1，并禁用了Radio 2。

- IW Service Offline
- IW Monitor Enabled
- QUADRO

- GENERAL SETTINGS
 - general mode
 - wireless radio
 - antenna alignment and stats
- NETWORK CONTROL
 - advanced tools
- ADVANCED SETTINGS
 - advanced radio settings
 - static routes
 - allowlist / blocklist
 - multicast
 - snmp
 - radius
 - ntp
 - ethernet filter
 - l2tp configuration
 - vlan settings
 - Fluidity
 - misc settings
 - smart license
- MANAGEMENT SETTINGS
 - remote access
 - firmware upgrade
 - status
 - configuration settings
 - reset factory default
 - reboot
 - logout

WIRELESS RADIO

Wireless Settings

"Shared Passphrase" is an alphanumeric string or special characters excluding `[apex]` `[double apex]` `[backtick]` `$(dollar)=[equal]` `\(backslash)` and whitespace (e.g. "mysecurecamnet") that identifies your network. It MUST be the same for all the Cisco URWB units belonging to the same network.

Shared Passphrase:

Show passphrase:

In order to establish a wireless connection between Cisco URWB units, they need to be operating on the same frequency.

Radio 1 Settings

Role:

Frequency (MHz):

Channel Width (MHz):

Radio 2 Settings

Role:

Reset

Save

3. ADVANCED SETTINGS > l2tp configuration:

在L2TP配置页面上，将同一子网内的L2TP WAN IP地址分配给网关，并指定WAN网关作为此子网的网关。本地UDP端口必须配置为5701。只有当全局网关与每个子网集群的网状终端无线电建立L2TP隧道时，才需要在网状终端无线电上进行此配置。

IW Service Offline

IW Monitor Enabled

QUADRO

GENERAL SETTINGS

- [general mode](#)
- [wireless radio](#)
- [antenna alignment and stats](#)

NETWORK CONTROL

- [advanced tools](#)

ADVANCED SETTINGS

- [advanced radio settings](#)
- [static routes](#)
- [allowlist / blocklist](#)
- [multicast](#)
- [snmp](#)
- [radius](#)
- [ntp](#)
- [ethernet filter](#)
- [l2tp configuration](#)
- [vlan settings](#)
- [Fluidity](#)
- [misc settings](#)
- [smart license](#)

MANAGEMENT SETTINGS

- [remote access](#)
- [firmware upgrade](#)
- [status](#)
- [configuration settings](#)
- [reset factory default](#)
- [reboot](#)
- [logout](#)

Configuration contains changes. Apply these changes?

[Discard](#)

[Review](#)

[Apply](#)

L2TP Configuration

Local Unit Configuration

WAN IP Address is local WAN IP address used for externally communicating with the remote tunnel peers. This address must be reachable from the external hosts, e.g. using port forwarding on the LAN gateway. WAN gateway is the local gateway used by the local unit to communicate with the outside world. Local UDP Port is the port used by remote peers to communicate with the local unit (0 means IP encapsulation).

L2TP

WAN IP Address	WAN Netmask	WAN Gateway	Local UDP Port
<input type="text" value="192.168.200.210"/>	<input type="text" value="255.255.255.0"/>	<input type="text" value="192.168.200.1"/>	<input type="text" value="5701"/>

Max number of L2TP tunnels:

[Cancel](#)

[Save](#)

L2TP Tunnels

L2TP Tunnels currently installed.

Remote IP Address	Remote UDP Port	Status	
192.168.20.12	5701	IDLE	del
192.168.20.13	5701	IDLE	del

Add a New L2TP Tunnel

Remote WAN IP address corresponds to the WAN IP address of the REMOTE unit. Remote UDP port is the port number of the REMOTE unit (0 means IP encapsulation).

Remote WAN IP Address	Remote UDP Port	
<input type="text"/>	<input type="text"/>	Add

4. ADVANCED SETTINGS > FLUIDITY:

在“流动性”(Fluidity)页面上，“设备角色”(Unit Role)必须为“基础设施”(Infrastructure)。对于第3层操作，“网络类型”必须设置为“多个子网”。



ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IW9167EH Configurator

5.246.2.0 - MESH END MODE

Sun Jun 22 19:26:26 EDT 2025

IW Service Offline

IW Monitor Enabled

QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- ethernet filter
- l2tp configuration
- vlan settings
- Fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

Configuration contains changes. Apply these changes? [Discard](#) [Review](#) [Apply](#)

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.
 The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.
 The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.
 The Network Type filed must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role:

Infrastructure

Network Type:

Multiple subnets

The following advanced settings allow to fine-tune the performance of the system depending on the specific environment. Please do not alter this settings unless you have read the manual first and you know what you are doing.
 The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic:

Standard

Reset

Save

配置车辆无线电

1. GENERAL SETTINGS > General Mode:

接下来需要配置车辆无线电。轨旁无线电可以跨越多个子网，同一子网下的无线电形成一个集群。每个集群都必须包含专用网状终端无线电，它用作CURWB无线电子网的入口和出口点。可以配置一个或两个网状终端，具体取决于是否需要高可用性(HA)。必须将子网内的其余轨道端无线电配置为网状点。

必须根据需要配置设备的本地IP、本地网络掩码和默认网关。



ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IW9165E Configurator

5.66.194.36 - MESH POINT MODE

Sun Jun 22 20:11:10 EDT 2025

IW Service Offline

IW Monitor Enabled

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- snmp
- radius
- ntp
- ethernet filter
- l2tp configuration
- vlan settings
- Fluidity
- misc settings

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

GENERAL MODE

General Mode

Select MESH POINT mode if you are attaching an IP edge device (i.e. network camera, encoder, etc.) to this Cisco IOT IW9165E Series Access Point or if you are using this unit as a relay point in the mesh network.

mesh point

Mode: mesh end
 gateway

Radio-off:

LAN Parameters

Local IP:

Local Netmask:

Default Gateway:

Local Dns 1:

Local Dns 2:

Enable IPv6:

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2. GENERAL SETTINGS > Wireless Radio:

在Wireless Radio页面上，必须使用与其他所有无线电相同的密码。无线接口的无线电角色必须配置为Fluidity。虽然可以根据项目要求将多个无线接口用于无线电，但本实验设置中仅配置了Radio 1，并禁用了Radio 2，以简化操作。

IW Service

Offline

IW Monitor

Enabled

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- snmp
- radius
- ntp

- ethernet filter

- l2tp configuration

- vlan settings

- Fluidity

- misc settings

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

WIRELESS RADIO

Wireless Settings

"Shared Passphrase" is an alphanumeric string or special characters excluding "[apex]" "[double apex]" "[backtick]" "\$[dollar]" "[equal]" "[backslash]" and whitespace (e.g. "mysecurecamnet") that identifies your network. It MUST be the same for all the Cisco URWB units belonging to the same network.

Shared Passphrase:

Show passphrase:

In order to establish a wireless connection between Cisco URWB units, they need to be operating on the same frequency.

Radio 1 Settings

Role: Fluidity

Frequency (MHz): 5180

Channel Width (MHz): 20

Radio 2 Settings

Role: Disabled

Reset

Save

3. ADVANCED SETTINGS > static routes:

如果车辆网络包含多个用于车载设备或服务端的子网，则必须在车载无线电上配置静态路由。在此配置中，必须指定板载子网和网络掩码，将网关设置为板载路由器上的相应接口。



ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IW9165E Configurator

5.66.194.36 - MESH POINT MODE

Sun Jun 22 20:09:49 EDT 2025

IW Service Offline

IW Monitor Enabled

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes →
- allowlist / blocklist
- snmp
- radius
- ntp
- ethernet filter
- l2tp configuration
- vlan settings
- Fluidity
- misc settings

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

STATIC ROUTES

Static routes

Add any remote subnet that does not belong to local networks

Active static routes

Subnet	Netmask	Gateway	
172.30.128.0	255.255.255.248	10.42.0.1	del

Add new static route

Subnet	Netmask	Gateway	
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	add

Route added. Note: unable to install static route live, please double check current network configuration.

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4. ADVANCED SETTINGS > FLUIDITY:

配置车辆无线电时，“单位角色”(Unit Role)必须设置为“车辆”(Vehicle)。要启用多个子网作为网络类型，必须先取消选中“自动车辆ID”。必须为每个车辆中的无线电设备分配唯一的车辆ID;但是，如果同一车辆上存在多个无线电，则必须为所有无线电设备配置相同的车辆ID。最后，将Network Type (网络类型) 设置为Multiple Subnets (多个子网)。

IW Service **Offline**
IW Monitor **Enabled**

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- snmp
- radius
- ntp
- ethernet filter
- l2tp configuration
- vlan settings
- Fluidity
- misc settings

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
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- reset factory default
- reboot
- logout

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.

The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.

The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.

The Network Type filed must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role:

Automatic Vehicle ID: Enable

Vehicle ID:

Network Type: Flat

Multiple subnets

The following advanced settings are available for the unit. Please do not alter these settings unless you have read the manual first and you know what you are doing.

The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic:

Reset

Save

注意：

虽然可通过GUI执行基本第3层配置，但为网状终端设备配置TITAN或VIP需要使用CLI或IW服务，因为这些选项在GUI中不可用。

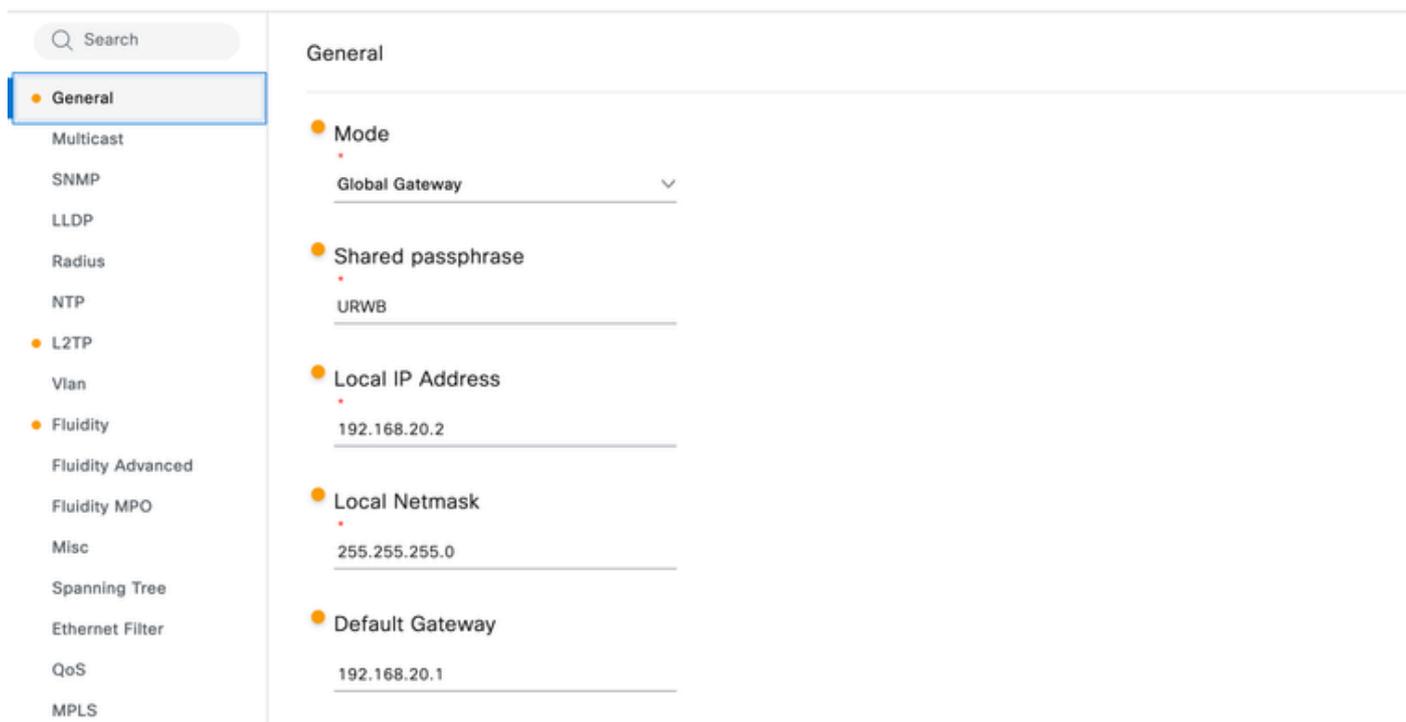
通过IW服务在IoT OD中配置第3层流动性

配置全局网关

1. 在“一般信息”部分中，必须将模式选择为全局网关，并且需要配置共享口令、本地IP地址、本

地网络掩码和默认网关。

Edit Device Configuration

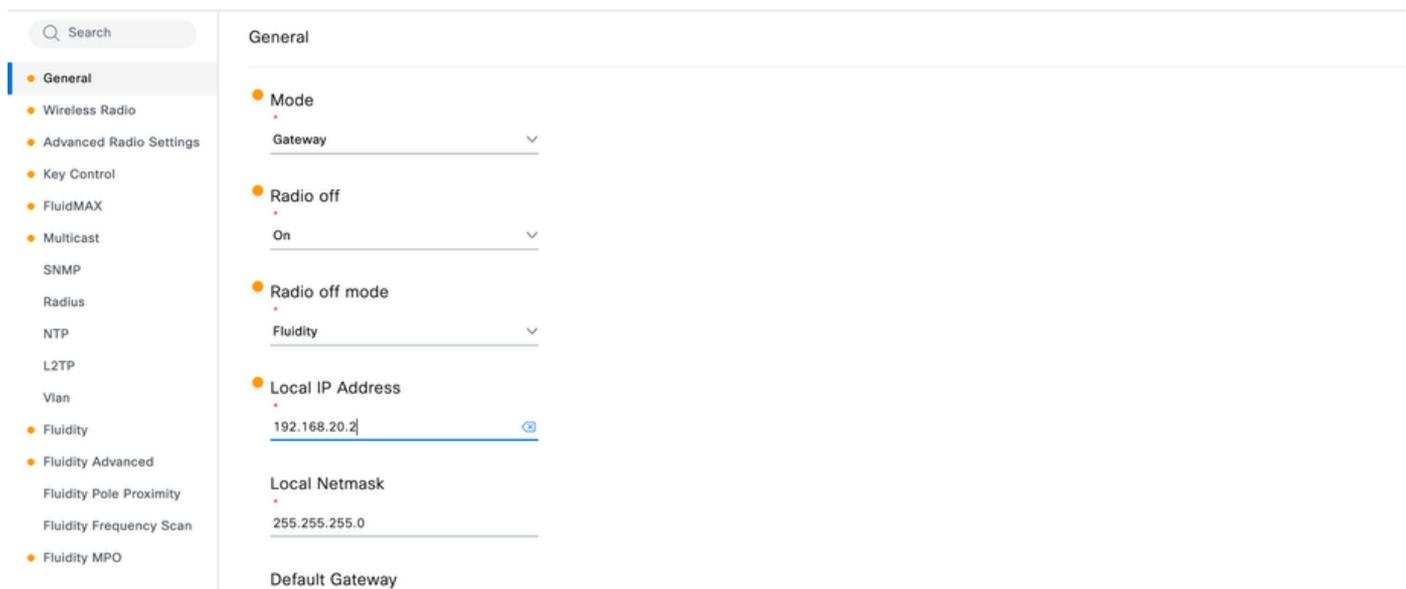


General

- Mode
 - Global Gateway
- Shared passphrase
 - URWB
- Local IP Address
 - 192.168.20.2
- Local Netmask
 - 255.255.255.0
- Default Gateway
 - 192.168.20.1

当将IW916X无线电配置为网关时，请注意，无线电关闭将自动启用，无线电关闭模式需要为流动性。

Edit Device Configuration



General

- Mode
 - Gateway
- Radio off
 - On
- Radio off mode
 - Fluidity
- Local IP Address
 - 192.168.20.2
- Local Netmask
 - 255.255.255.0
- Default Gateway

2. 在L2TP部分，WAN IP、WAN网络掩码、WAN网关、端口。需要配置。同时，需要添加L2TP隧道。

Edit Device Configuration

Q Search

- General
- Multicast
- SNMP
- LLDP
- Radius
- NTP
- L2TP**
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity MPO
- Misc
- Spanning Tree
- Ethernet Filter
- QoS
- MPLS

Enable L2TP
on

L2TP Interface
Ethernet1

WAN IP Address
192.168.20.12

WAN Netmask
255.255.255.0

WAN Gateway
192.168.20.1

Local UDP Port
5701

Edit Device Configuration

Q Search

- General
- Multicast
- SNMP
- LLDP
- Radius
- NTP
- L2TP**
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity MPO
- Misc
- Spanning Tree
- Ethernet Filter
- QoS
- MPLS

5701

Layer-3 MTU for the WAN interface
1480

L2TP Tunnels Number
6

L2TP Tunnels

Remote WAN IP Address	Remote UDP Port
192.168.200.210	5701

3. 最后，需要启用流动性，设备角色必须是基础设施，而网络类型必须是多个子网。

Edit Device Configuration

- General
- Multicast
- SNMP
- LLDP
- Radius
- NTP
- L2TP
- Vlan
- Fluidity**
- Fluidity Advanced
- Fluidity MPO
- Misc
- Spanning Tree
- Ethernet Filter
- QoS
- MPLS

Fluidity

Unit Role
Infrastructure

Network Type
Multiple subnet

Enable Primary Pseudowire Enforcement
Disable

配置跟踪端无线电：

1. 在“一般信息”部分中，必须选择“模式”作为“网状终端”，并且需要配置共享口令、本地IP地址、本地网络掩码和默认网关。

注意：但对于网状点跟踪端无线电模式，将采用网状点

Edit Device Configuration

- General**
- Wireless Radio
- Advanced Radio Settings
- Key Control
- FluidMAX
- Multicast
- SNMP
- Radius
- NTP
- L2TP
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity Pole Proximity
- Fluidity Frequency Scan
- Fluidity MPO

Mode
Mesh End

Radio off
Off

Radio off mode
Parameter disabled

Local IP Address
10.122.136.50

Local Netmask
255.255.255.192

Default Gateway
10.122.136.1

2. 在Wireless Radio Section， Passphrase， Radio Interface（您想使用它来与车辆通信），需要配置频率和口令

Edit Device Configuration

Q Search

- General
- Wireless Radio**
- Advanced Radio Settings
- Key Control
- FluidMAX
- Multicast
- SNMP
- Radius
- NTP
- L2TP
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity Pole Proximity
- Fluidity Frequency Scan
- Fluidity MPO

Wireless Radio

- Passphrase
URWB
- Radio 1 enabled: On
- Radio 2 enabled: Off
- Radio 1 role: Fluidity
- Radio 2 role: Parameter disabled
- Radio 1 Frequency (MHz): 5180 MHz
- Radio 2 Frequency (MHz): Parameter disabled
- Radio 1 Channel width: 20
- Radio 2 Channel width: Parameter disabled

3. 在L2TP部分，WAN IP、WAN网络掩码、WAN网关、端口。需要配置。同时，需要添加L2TP隧道。

Edit Device Configuration

Q Search

- General
- Wireless Radio
- Advanced Radio Settings
- Key Control
- FluidMAX
- Multicast
- SNMP
- Radius
- NTP
- L2TP**
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity Pole Proximity
- Fluidity Frequency Scan
- Fluidity MPO

- Enable L2TP: on
- L2TP Interface: Ethernet1
- WAN IP Address: 192.168.200.210
- WAN Netmask: 255.255.255.0
- WAN Gateway: 192.168.200.1
- Local UDP Port: 5701

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' page for L2TP tunnels. On the left is a navigation menu with options: General, Wireless Radio, Advanced Radio Settings, Key Control, FluidMAX, Multicast, SNMP, Radius, NTP, L2TP (highlighted), Vlan, Fluidity, Fluidity Advanced, Fluidity Pole Proximity, Fluidity Frequency Scan, and Fluidity MPO. The main content area is titled 'L2TP Tunnels Number' and shows the value '6'. Below this is a section for 'L2TP Tunnels' containing two tunnel configuration boxes. Each box has fields for 'Remote WAN IP Address' and 'Remote UDP Port'. The first tunnel has IP '192.168.20.12' and port '5701'. The second tunnel has IP '192.168.20.13' and port '5701'. There are icons for deleting and adding tunnels.

4. 最后，需要启用流动性，设备角色必须是基础设施，而网络类型必须是多个子网

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' page for Fluidity settings. On the left is a navigation menu with options: General, Wireless Radio, Advanced Radio Settings, Key Control, FluidMAX, Multicast, SNMP, Radius, NTP, L2TP, Vlan, Fluidity (highlighted), Fluidity Advanced, Fluidity Pole Proximity, Fluidity Frequency Scan, and Fluidity MPO. The main content area is titled 'Fluidity' and contains several settings: 'Unit Role' is set to 'Infrastructure'; 'Automatic Vehicle ID' is 'Parameter disabled'; 'Vehicle ID' is 'Parameter disabled'; 'Network Type' is set to 'Multiple subnet'; 'Handoff Logic' is 'Parameter disabled'; and 'Enable Primary Pseudowire' is checked.

配置车辆无线电

1. 在“一般信息”部分中，必须选择“模式”作为“网状终端”，并且需要配置共享口令、本地IP地址、本地网络掩码和默认网关。

Edit Device Configuration

Q Search

- General
- Wireless Radio
- Advanced Radio Settings
- Key Control
- FluidMAX
- Multicast
- SNMP
- Radius
- NTP
- L2TP
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity Pole Proximity
- Fluidity Frequency Scan
- Fluidity MPO

Mode

Mesh Point

Radio off

Off

Radio off mode

Parameter disabled

Local IP Address

10.42.0.2

Local Netmask

255.255.255.248

Default Gateway

10.42.0.1

2. 在Wireless Radio Section , Passphrase , Radio Interface (您要使用它来与跟踪端通信) , 需要配置频率和口令

Edit Device Configuration

Q Search

- General
- Wireless Radio
- Advanced Radio Settings
- Key Control
- FluidMAX
- Multicast
- SNMP
- Radius
- NTP
- L2TP
- Vlan
- Fluidity
- Fluidity Advanced
- Fluidity Pole Proximity
- Fluidity Frequency Scan
- Fluidity MPO

Wireless Radio

Passphrase

CiscoURWB

Radio 1 enabled

On

Radio 2 enabled

Off

Radio 1 role

Fluidity

Radio 2 role

Parameter disabled

Radio 1 Frequency (MHz)

5180 MHz

Radio 2 Frequency (MHz)

Parameter disabled

Radio 1 Channel width

20

Radio 2 Channel width

Parameter disabled

3. 最后，需要启用流动性，并且设备角色必须是车辆，并且必须手动选择车辆ID，同时网络类型必须是多个子网

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' interface. On the left is a navigation menu with categories like General, Wireless Radio, Advanced Radio Settings, Key Control, FluidMAX, Multicast, SNMP, Radius, NTP, L2TP, Vlan, Fluidity (selected), Fluidity Advanced, Fluidity Pole Proximity, Fluidity Frequency Scan, and Fluidity MPO. The main content area is titled 'Fluidity' and contains several configuration fields: 'Unit Role' set to 'Vehicle', 'Automatic Vehicle ID' set to 'Parameter disabled', 'Vehicle ID' set to '1', 'Network Type' set to 'Multiple subnet', and 'Handoff Logic' set to 'Standard'.

4. 如果车辆网络包含多个用于车载设备或服务器的子网，则必须在车载无线电上配置静态路由。在此配置中，必须指定板载子网和网络掩码，将网关设置为板载路由器上的相应接口。

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' interface with the 'Static Routes' section selected in the left navigation menu. The main content area is titled 'Static Routes' and contains a configuration box with the following fields: 'Subnet*' set to '172.30.128.0', 'Netmask*' set to '255.255.255.248', and 'Gateway*' set to '10.42.0.1'. There are also two circular icons (one with a minus sign, one with a plus sign) to the right of the configuration box.

通过CLI配置第3层流动性

本节根据文章开头显示的拓扑概述了CURWB设备的CLI配置。假设FastFail冗余在全局网关、轨道侧网状网端和车辆上实施。有关特定FastFail冗余配置步骤，请参阅前面提到的文章。此处仅介绍特定于第3层流动性的VIP概念，并假设所有必需的无线电上已配置FastFail。

配置全局网关

将IEC6400配置为网关

```
iotod-iw configure offline
```

```
### BASIC CONFIG ###
```

```
modeconfig passphrase URWB  
ip addr 192.168.20.2 netmask 255.255.255.0 gateway 192.168.20.1  
modeconfig layer 3 mode gateway  
l2tp wan 192.168.20.12 255.255.255.0 192.168.20.1 port 5701  
l2tp add 192.168.200.210 5701
```

```
### APPLY CONFIG ###
```

```
write  
reboot
```

将AP无线电配置为网关：

```
configure iotod-iw offline
```

```
### BASIC CONFIG ###
```

```
configure ap address ipv4 static 192.168.20.2 255.255.255.0 192.168.20.1  
configure modeconfig mode gateway  
configure modeconfig mode meshend radio-off fluidity  
configure wireless passphrase URWB  
configure fluidity id infrastructure  
configure l2tp wan 192.168.20.12 255.255.255.0 192.168.20.1  
configure l2tp port 5701  
configure l2tp add 192.168.200.210 5701  
mpls fastfail primary 192.169.20.4 // Set the virtual IP address of the redundant device group in
```

```
### APPLY CONFIG ###
```

```
write  
Reload
```

配置跟踪端无线电

```
configure iotod-iw offline
```

```
### BASIC CONFIG ###
```

```
configure ap address ipv4 static 192.168.200.10 255.255.255.0 192.168.200.1  
configure modeconfig mode meshend //Applicable for only Mesh End Trackside Radio  
configure modeconfig mode meshpoint //Applicable for only Mesh point Trackside Radio  
configure wireless passphrase URWB  
configure dot11Radio 1 enable  
configure dot11Radio 1 channel 149  
configure dot11Radio 1 band-width 20  
configure dot11Radio 1 antenna ab-antenna
```

```

configure dot11Radio 1 antenna gain 10
configure dot11Radio 1 txpower-level AUTO
configure dot11Radio 1 mode fluidity
configure dot11Radio 2 disable
mpls fastfail primary 192.168.200.13 // Set the virtual IP address of the redundant device group in Layer-3
configure modeconfig mode meshend mpls layer 3 //Applicable for only Mesh End Trackside Radio
configure modeconfig mode meshpoint mpls layer 3 //Applicable for only Mesh point Trackside Radio
configure fluidity id infrastructure

## L2TP CONFIG ## //Applicable only to the mesh end Trackside radios

configure l2tp wan 192.168.200.210 255.255.255.0 192.168.200.1
configure l2tp port 5701
configure l2tp add 192.168.20.12 5701
configure l2tp add 192.168.20.13 5701

### APPLY CONFIG ###

write
Reload

```

配置车辆无线电。

```

configure iotod-iw offline

### BASIC CONFIG ###

configure ap address ipv4 static 10.42.0.2 255.255.255.248 10.42.0.1
configure modeconfig mode meshpoint
configure wireless passphrase URWB
configure dot11Radio 1 enable
configure dot11Radio 1 channel 149
configure dot11Radio 1 band-width 20
configure dot11Radio 1 antenna ab-antenna
configure dot11Radio 1 antenna gain 10
configure dot11Radio 1 txpower-level AUTO
configure dot11Radio 1 mode fluidity
configure dot11Radio 2 disable
configure modeconfig mode meshpoint mpls layer 3
configure fluidity id vehicle-id 1
configure ip route add 172.30.128.0 255.255.255.248 10.42.0.1
mpls fastfail primary 10.42.0.6 // Set the virtual IP address of the redundant device group in Layer-3

### APPLY CONFIG ###

write
Reload

```

交换机/路由器配置：

核心路由器配置：

```
configure terminal
ip route 172.30.128.0 255.255.255.248 192.168.20.4
ip route 10.42.0.1 255.255.255.248 192.168.20.4
exit
write
```

板载路由器配置：

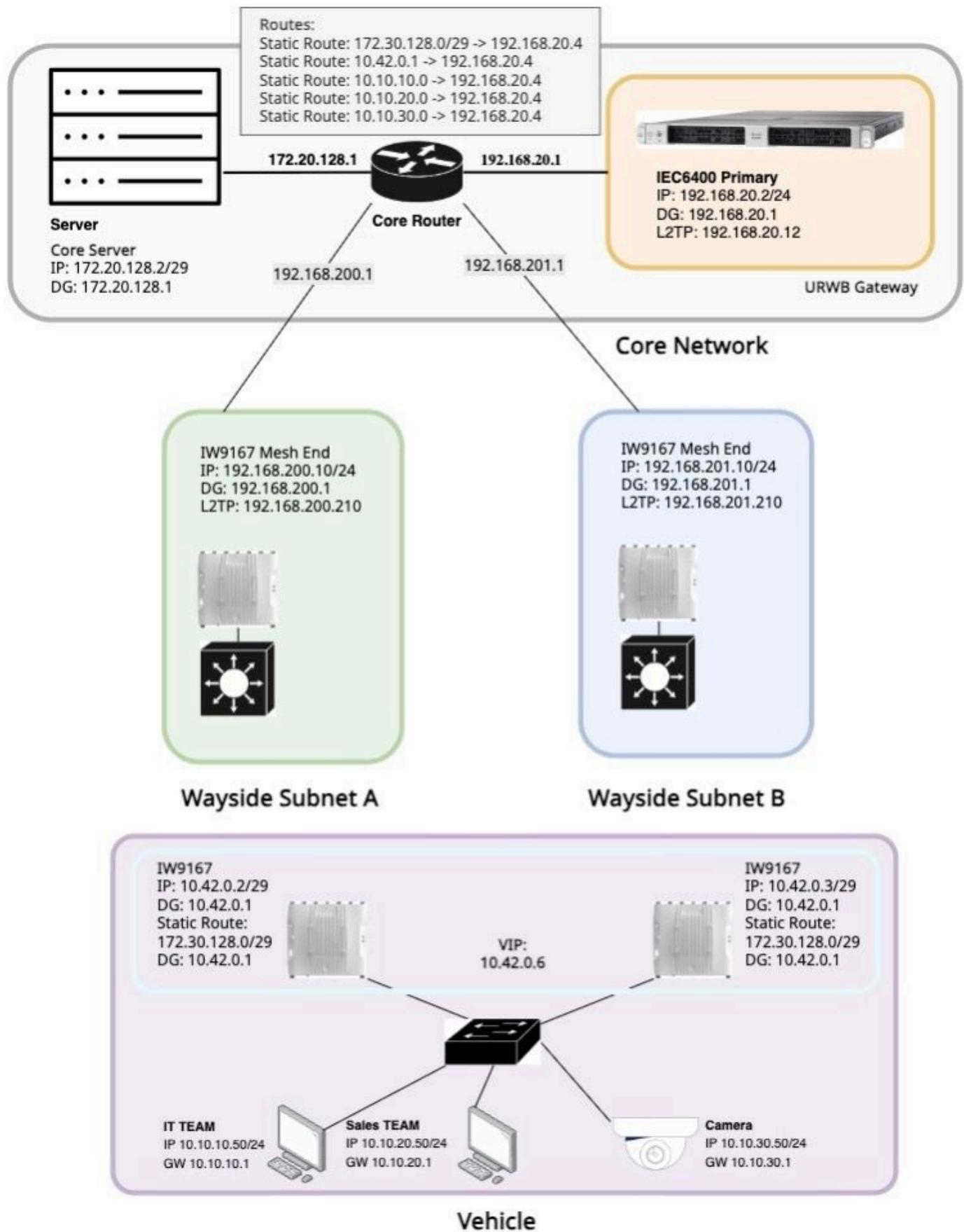
```
configure terminal
ip route 0.0.0.0 0.0.0.0 10.42.0.6
exit
write
```

板载网络的CURWB L3变体

板载托管L2交换机，无路由器

- 此配置描述了混合第3层网络环境，其中在移动的车辆上存在中继VLAN。
- 它适用于没有车载路由器的车辆单元。
- 在此设置中：
 - 必须在车载无线电上配置VLAN。
 - 必须在所有基础设施单元和全局网关上禁用VLAN功能。
 - 此方法有助于保持本地子网与核心网络之间的连接。
 - 注意：在此应用中，板载射频不会替换通常负责标准Fluidity第3层拓扑中VLAN间路由的第3层设备。

无板载路由器的第3层流动性的网络拓扑变化



板载交换机的配置

```
Switch#show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Gi1/0/3, Gi1/0/6, Gi1/0/7 Gi1/0/8, Gi1/0/9, Gi1/0/10 Gi1/0/13, Gi1/0/22
10	IT	active	Gi1/0/16
20	SALES	active	Gi1/0/17
30	CAMERA	active	Gi1/0/18
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
Switch #show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/23	on	802.1q	trunking	100
Gi1/0/24	on	802.1q	trunking	100

Port	Vlans allowed on trunk
Gi1/0/23	1-4094
Gi1/0/24	1-4094

Port	Vlans allowed and active in management domain
Gi1/0/23	1,10,20,30,60,100
Gi1/0/24	1,10,20,30,60,100

Port	Vlans in spanning tree forwarding state and not pruned
Gi1/0/23	1,10,20,30,60,100
Gi1/0/24	1,10,20,30,60,100

板载无线电的配置

- VLAN必须仅在没有车载路由器的车辆单元上启用。

```
configure vlan status enabled  
configure vlan management 60  
configure vlan native 60
```

- 添加静态路由非常重要，这样车辆设备才能将本地子网通告给全局网关。子网的网关是用于2个板载无线电的虚拟IP。如果是单个无线电，则必须将该无线电的IP地址用作网关。

```
configure ip route add 10.10.10.0 255.255.255.0 10.42.0.6  
configure ip route add 10.10.20.0 255.255.255.0 10.42.0.6  
configure ip route add 10.10.30.0 255.255.255.0 10.42.0.6
```

核心路由器的配置

```
configure terminal
ip route 10.10.10.0 255.255.255.0 192.168.20.4
ip route 10.10.20.0 255.255.255.0 192.168.20.4
ip route 10.10.30.0 255.255.255.0 192.168.20.4
exit
write
```

CURWB 3层网络故障排除：

在Fluidity L3网络场景中，L2TP隧道状态是需要检查的最重要设置之一；事实上，通向处于IDLE或WAIT状态或未正确配置的集群的L2TP隧道会在车辆连接到该特定集群时阻止车辆和主干之间的通信。

检查隧道状态的简单方法是：在CLI上运行“show l2tp”或从GUI中检查状态。

L2TP隧道验证

- L2TP页面显示当前L2TP隧道及其状态(CONN、WAIT、IDLE)。
- 当两个网状终端都启动并运行时，在主网状终端上，L2TP状态将为CONN状态，而在辅助网状终端上，L2TP状态将为IDLE状态。如果由于配置错误或物理问题导致隧道中存在连接问题，我将处于等待状态
- 在此处，可以检查当前状态并删除已安装的L2TP隧道（如果需要）。
- WAN IP地址对于每个设备的L2TP配置都是唯一的，并且必须与设备的管理IP地址不同。

L2TP状态汇总

- 每个全局网关与每个远程Mesh端建立L2TP隧道
- 每个集群网状终端与全局网关建立L2TP隧道

当系统处于正常状态（所有设备都已启动并运行）时，这是全局网关和每个L3流量跟踪端集群之间的预期场景：

- 主全局网关和主网状终端之间的L2TP隧道 — CONN
- 主全局网关和辅助网状终端之间的L2TP隧道 — 空闲
- 辅助全局网关和主网状终端之间的L2TP隧道 — 空闲
- 辅助全局网关和辅助网状终端之间的L2TP隧道 — IDLE

典型配置问题/要检查的事项

- 在同一个设备的多个接口上使用相同的IP、WAN IP或虚拟IP。
- 配置的远程IP地址不正确；设备指向的IP不是远程设备的正确WAN IP。

- 重复的WAN IP;同一集群内的两个网状终端配置有相同的WAN IP。
- 配置为通过未连接到网络的以太网端口建立的隧道。
- UDP端口不匹配；本地设备和远程对等设备使用不同的UDP端口进行流量封装。

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