

在URWB模式下配置IW接入點的第3層流動性並排除故障

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簡介

本文檔介紹為CURWB裝置設定第3層流動性的配置，並為排除網路故障提供實用的指導。

目標是確保無縫的設定過程，並為您配備有效解決潛在問題的工具。

採用元件

本檔案所詳述的組態涉及以下硬體元件：

- Cisco Catalyst IW9167

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

什麼是流動性？

在CURWB（思科超可靠無線回程）的範疇內，Fluidity是一種以多重協定標籤交換(MPLS)技術為基礎的網路架構，旨在有效交付IP封裝資料。

在CURWB行動網路中，當現有鏈路被破壞並且新鏈路建立時，會發生切換過程。這種切換類似於網路拓撲更改，這是高速移動場景中的一項關鍵挑戰。

傳統的檢測此類更改和重新配置節點的機制通常速度太慢，而且需要大量資料，導致效能不佳。

為了克服這些限制，Fluidity引入了一種快速切換解決方案，該解決方案提供了低至一毫秒延遲的快速路徑重新配置。

此機制通過擴展網路的控制平面並利用針對節點MPLS轉發資訊庫(FIB)表的專用操作技術，增強了高移動性場景中的即時效能。

在Fluidity架構中，移動節點在相互檢測時動態建立與軌道側無線電的偽線。

當車輛沿軌道移動時，它基於預定流動性引數啟動從一個軌道側無線電裝置到另一個的越區切換，從而確保無縫連線和最優效能

需要第3層流動性

第3層流動性提供了一系列功能，可解決多網路環境中的移動難題。主要優勢包括：

1. 跨子網的無縫切換

第3層流暢性使車輛能夠在軌道邊基站或屬於不同子網的無線電之間無縫過渡。

2. L2TP通道整合

這種無縫連線是通過使用第2層隧道協定(L2TP)隧道實現的。這些隧道將每個網路群集或站點上的網狀終端連線到位於網路核心的集中式Fluidmesh網關裝置，稱為全域性網關。

3. 集中式MPLS路由

每個全域性網關在每個網路群集或子網處與網狀端建立L2TP隧道。此配置允許MPLS路由在全域性網關上進行，無需在每個子網進行常規的第3層路由。

4. 切換期間的不間斷連線

利用第3層流動性，車輛可以在多個路邊網路集群之間移動，每個集群都屬於不同的網路或子網，而不會丟失與核心網路的端到端連線，即使在切換期間也是如此。

5. 跨廣域部署的可擴充性

第3層流動性旨在跨多個網路部署和站點進行擴展，即使這些站點相距很遠。無論站點是通過專用光纖鏈路連線還是通過ISP等公共域基礎設施連線，它都能無縫工作。

6. 實現無縫路由的子網拼合

第3層流暢運行在現有網路基礎設施之上，並使用L2TP封裝「拼合」子網。這些封裝為跨多個網路一直回到核心網路的車輛建立了無縫的路由和端到端連線。

流動性第3層主要概念

- 軌道側子網和全域性網關網路之間的通訊依賴於客戶路由的IP網路，而與車輛網路的連線則通過MPLS和L2TP隧道建立。
- 每個軌道邊無線電網路至少需要一個網狀End，網路位於不同的廣播域中。
- 每個全域性網關必須連線到每個網狀終端的L2TP WAN地址
- 車載的CURWB無線電必須具有每個本地子網的靜態路由，使地址通告返回全域性網關以實現網路融合。
- 車載路由器的IP地址必須設定為車輛無線電的預設網關

用於第3層流動性的網路拓撲

本檔案將概述思科超可靠無線回程(CURWB)第3層網路設計的架構。

這種穩健的拓撲結構被設計為便於移動車輛和固定路邊基礎設施之間的無縫和可靠通訊，最終將資料整合到一個集中的企業網路中。

該設計利用第3層路由對網路進行邏輯分段，確保不同操作域之間的高效資料流和可擴充性。

汽車分部：每個「車輛」都配備一個板載路由器、一個板載交換機、板載伺服器 and 兩個IW9167裝置，提供關鍵硬體冗餘。

板載路由器充當車輛內部網路的主要網關，連線到板載交換機，從而便於連線IW9167裝置和板載伺服器。

跟蹤端子網：該基礎設施包括多個「跟蹤端子網」（例如，跟蹤端子網A、跟蹤端子網n），每個子網包含各種IW9167無線電，包括網狀終端和網狀點裝置。

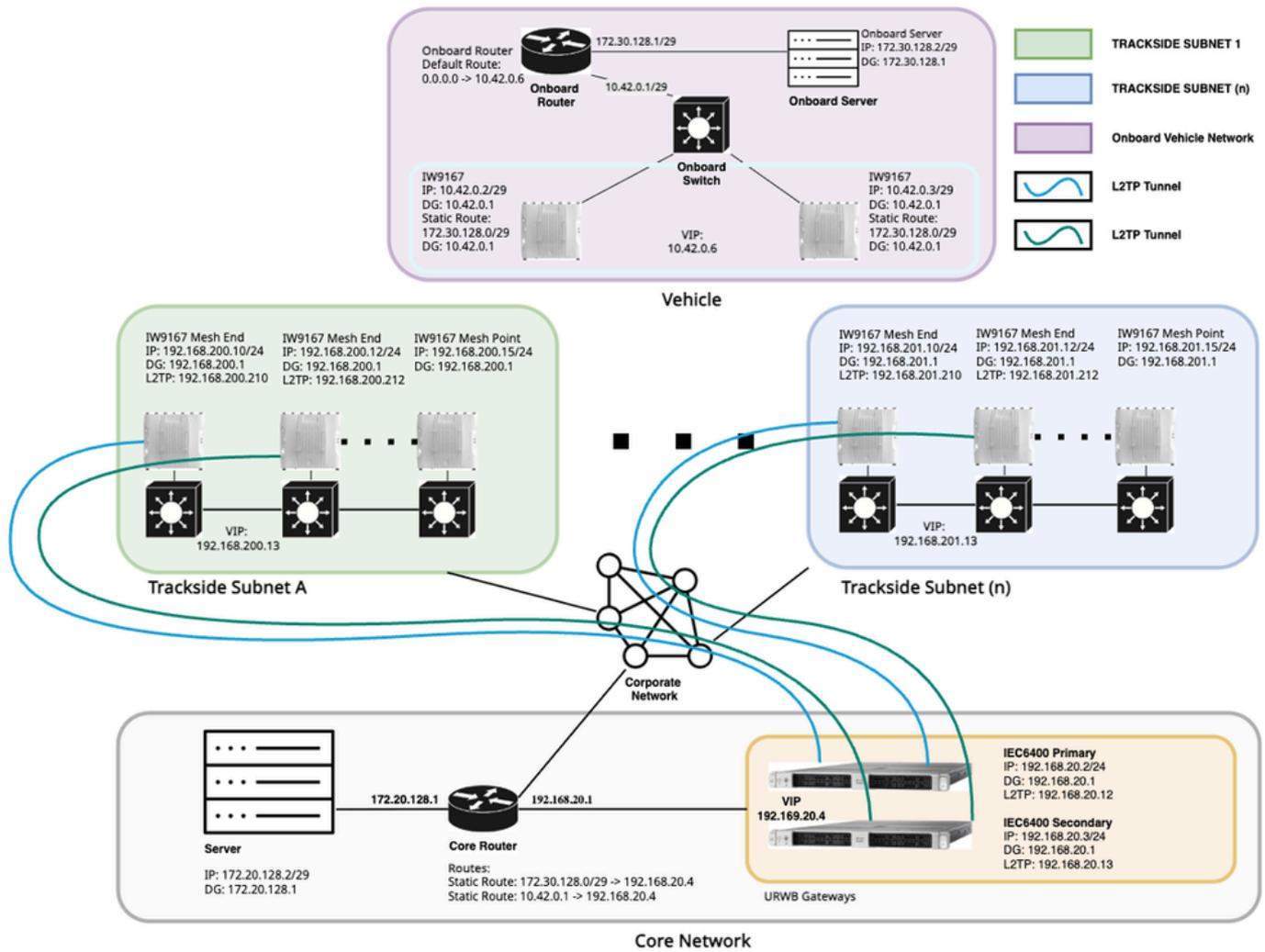
每個軌跡端子網在其輸入/輸出點設計有兩個網狀終端裝置，實現硬體冗餘的「快速失敗」功能。

此設定允許每個子網部分代表不同的地理區域，使車輛在這些區域之間無縫漫遊，同時保持與公司

網路的持續連線。

企業網路：此中心網路充當主幹，連線到所有跟蹤端子網並容納核心基礎架構。它包括核心伺服器、核心路由器和冗餘URWB網關（主要和輔助IEC6400裝置）。

核心路由器負責匯聚來自各個跟蹤端子網的流量，並管理靜態路由，以確保企業網路與車輛和跟蹤端網段之間的高效通訊。



網路IP配置摘要

元件/裝置	IP 位址	子網	預設閘道	L2TP地址	備註
車輛段					
板載 IW9167(1)	10.42.0.2	255.255.255.248	10.42.0.1	不適用	靜態路由 172.30.128.0/29 > 10.42.0.1

板載 IW9167(2)	10.42.0.3	255.255.255.248	10.42.0.1	不適用	VIP:10.42.0.6
Onboard伺 服器	172.30.128.2	255.255.255.248	172.30.128.1	不適用	
板載路由器 IW介面	10.42.0.1	255.255.255.248			預設路由 : 0.0.0.0 -> 10.42.0.6
板載路由器 網路介面	172.30.128.1	255.255.255.248			
路口資料段 (子網A)					
網狀終端 IW9167(1)	192.168.200.10	255.255.255.0	192.168.200.1	192.168.200.210	VIP 192.168.200.13
網狀終端 IW9167(2)	192.168.200.12	255.255.255.0	192.168.200.1	192.168.200.212	
網狀點 IW9167	192.168.200.15	255.255.255.0	192.168.200.1		
路口資料段 (子網B)					
網狀終端 IW9167(1)	192.168.201.10	255.255.255.0	192.168.201.1	192.168.201.210	VIP 192.168.201.13
網狀終端 IW9167(2)	192.168.201.12	255.255.255.0	192.168.201.1	192.168.201.212	
網狀點 IW9167	192.168.201.15	255.255.255.0	192.168.201.1		
核心網段					

網關 IEC6400(1)	192.168.20.2	255.255.255.0	192.168.20.1	192.168.20.12	VIP 192.168.20.4
網關 IEC6400(1)	192.168.20.3	255.255.255.0	192.168.20.1	192.168.20.13	
核心路由器 網關介面	192.168.20.1	255.255.255.0			靜態路由 : 172.30.128.0/29 -> 192.168.20.4 靜態路由 : 10.42.0.1 -> 192.168.20.4
核心路由器 跟蹤端子網 A介面	192.168.200.1	255.255.255.0			
核心路由器 跟蹤端子網 n介面	192.168.201.1	255.255.255.0			
核心路由器 伺服器介面	172.20.128.2	255.255.255.248	172.20.128.1		

配置第3層流動性

本文檔介紹基本的第3層配置，僅重點介紹建立核心網路和車輛網路之間的連線所需的基本設定。本概述中不包括非基本配置和高級功能。

此配置遵循在全域性網關、本地網狀端和車輛無線電處引入硬體冗餘(FastFail)的設計，並假設FastFail已經配置。

請注意，無法通過GUI配置MPLS FastFail(HA)和VIP，因此需要使用CLI或IW服務。有關MPLS FastFail配置的詳細指導，請參閱以下文章：

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

無線電配置：

通過GUI配置第3層流動性：

配置全域性網關：

1. GENERAL SETTINGS > General Mode:

IEC6400配置為全域性網關，設計為CURWB第3層網路的入口和出口點，實現核心到車輛連線。IEC6400的網關操作在Fluidity頁面上配置。

相反，當IW9167等裝置用作第3層網路的全域性網關時，需要在General Mode頁面進行明確的網關配置。此外，在網關模式下配置IW無線電會禁用無線介面，因此「無線電關閉」模式必須設定為「流動性」。

對於IEC-6400，密碼在General Mode頁面上配置，而對於其他無線電在Wireless Radio頁面上設定。對於所有軌道邊和車輛裝置而言，使用相同的密碼以確保連通性至關重要。

必須根據需要配置裝置的本地IP、本地網路掩碼和預設網關。

The screenshot displays the Cisco URWB IEC-6400-URWB Configurator interface. The top header includes the Cisco logo, the text "ULTRA RELIABLE WIRELESS BACKHAUL", and the title "Cisco URWB IEC-6400-URWB Configurator" with the IP address "5.69.163.198 - MESH END MODE" and the date "Sun 22 Jun 2025 11:53:05 AM HST".

The left sidebar contains a navigation menu with the following items:

- 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
 - l2tp configuration
 - vlan settings
 - Fluidity
 - misc settings
 - smart license
- MANAGEMENT SETTINGS
 - remote access
 - status
 - configuration settings
 - local certificate
 - reset factory default
 - reboot
 - logout

The main content area is titled "GENERAL MODE" and contains the following sections:

- General Mode**: A text box for "Mesh Passphrase" with a masked input field (••••••••) and a "Show passphrase" checkbox.
- LAN Parameters**: Three text boxes for "Local IP" (192.168.20.2), "Local Netmask" (255.255.255.0), and "Default Gateway" (192.168.20.1). Below these are two empty text boxes for "Local Dns 1" and "Local Dns 2".
- Buttons for "Reset" and "Save".

At the bottom of the page, there is a copyright notice: "© 2024 Cisco and/or its affiliates. All rights reserved."

2. ADVANCED SETTINGS > l2tp configuration:

在L2TP配置頁面上，將L2TP WAN IP地址分配給網關所在的同一子網，並指定WAN網關作為此子網的網關。本地UDP埠必須配置為5701。

Cisco URWB IEC-6400-URWB Configurator
5.69.163.198 - MESH END MODE
Sun 22 Jun 2025 12:15:25 PM HST

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

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
192.168.20.12	255.255.255.0	192.168.20.1	5701

Max number of L2TP tunnels: 10

[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. 高級設定>流動性：

在「流動性」頁面上，必須啟用「流動性」模式。IEC6400裝置角色只能配置為基礎設施。對於第3層操作，必須將Network Type（網路型別）設定為Multiple Subnets（多個子網），並且必須選擇

Global Gateway (全域性網關) 選項。

CISCO
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 field 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: Infrastructure

Network Type: Multiple subnets

Enable Global Gateway:

Reset Save

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配置跟蹤端無線電

1. GENERAL SETTINGS > General Mode:

接下來需要配置跟蹤端無線電。軌道端無線電可以跨越多個子網，同一子網下的無線電形成一個集群。每個集群都必須包含專用網狀終端無線電，它充當該CURWB無線電子網的入口和出口點。根據是否需要高可用性(HA)，可以配置一個或兩個網狀端。必須將子網內的其餘跟蹤端無線電配置為網狀點。

必須根據需要配置裝置的本地IP、本地網路掩碼和預設網關。

The screenshot displays the Cisco URWB IW9167EH Configurator interface. The top left features the Cisco logo and the text "ULTRA RELIABLE WIRELESS BACKHAUL". The top right shows the device name "Cisco URWB IW9167EH Configurator" and version "5.246.2.0 - MESH END MODE", along with the date and time "Sun Jun 22 19:03:41 EDT 2025".

The left sidebar contains navigation options: "IW Service" (Offline), "IW Monitor" (Enabled), and "QUADRO". Below these are sections for "GENERAL SETTINGS", "NETWORK CONTROL", "ADVANCED SETTINGS", and "MANAGEMENT SETTINGS", each with a list of sub-options.

The main content area is titled "GENERAL MODE" and includes a "General Mode" section with a description: "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)." It features three radio buttons for "Mode": "mesh point", "mesh end" (selected), and "gateway". There is also a "Radio-off" checkbox.

The "LAN Parameters" section contains input fields for "Local IP" (192.168.200.10), "Local Netmask" (255.255.255.0), "Default Gateway" (192.168.200.1), "Local Dns 1", and "Local Dns 2". An "Enable IPv6" checkbox is also present.

At the bottom of the configuration area are "Reset" and "Save" buttons. The footer contains the copyright notice: "© 2025 Cisco and/or its affiliates. All rights reserved."

2. GENERAL SETTINGS > Wireless Radio:

在Wireless Radio (無線電) 頁面上，必須使用與所有其他無線電相同的密碼。無線介面的無線電角色必須配置為「流動性」。雖然根據專案要求可以將多個無線介面用於無線電，但為了簡便起見，本實驗設定中僅配置了Radio 1，並禁用了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:

3. ADVANCED SETTINGS > l2tp configuration:

在L2TP配置頁面上，將L2TP WAN IP地址分配給網關所在的同一子網，並指定WAN網關作為此子網的網關。本地UDP埠必須配置為5701。僅當全域性網關與每個子網群集的網狀終端無線電建立L2TP隧道時，才需要在網狀終端無線電上執行此配置。

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. 高級設定>流動性：

在「流動性」頁面上，「裝置角色」必須是「基礎設施」。對於第3層操作，網路型別必須設定為 Multiple Subnets。

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

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 field 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

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
- i2tp configuration
- vlan settings
- Fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

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

配置車輛無線電

1. GENERAL SETTINGS > General Mode:

接下來需要配置車輛無線電。軌道端無線電可以跨越多個子網，同一子網下的無線電形成一個集群。每個集群都必須包含專用網狀終端無線電，它充當該CURWB無線電子網的入口和出口點。根據是否需要高可用性(HA)，可以配置一個或兩個網狀端。必須將子網內的其餘跟蹤端無線電配置為網狀點。

必須根據需要配置裝置的本地IP、本地網路掩碼和預設網關。



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:

ResetSave

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2. GENERAL SETTINGS > Wireless Radio:

在Wireless Radio (無線電) 頁面上，必須使用與所有其他無線電相同的密碼。無線介面的無線電角色必須配置為「流動性」。雖然根據專案要求可以將多個無線介面用於無線電，但本實驗設定中僅配置了Radio 1，並且禁用了Radio 2，以簡化操作。

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:

如果車載網路包含用於車載裝置或伺服器的多個子網，則必須在車載無線電上配置靜態路由。在此配置中，必須指定板載子網和網路掩碼，並將網關設定為板載路由器上的相應介面。



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: 90%; height: 20px;" type="text"/>	<input style="width: 90%; height: 20px;" type="text"/>	<input style="width: 90%; height: 20px;" type="text"/>	add

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

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4. 高級設定>流動性：

配置車輛無線電時，「單位角色」必須設定為「車輛」。要啟用多個子網作為網路型別，必須先取消選中「自動車輛ID」。必須為每個車輛中的無線電裝置分配唯一的車輛ID;但是，如果同一車輛上存在多個無線電，則必須為所有無線電裝置配置相同的車輛ID。最後，將Network Type (網路型別) 設定為Multiple Subnets (多個子網)。

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

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

附註：

雖然可通過GUI執行基本第3層配置，但為網狀終端裝置配置TITAN或VIP需要使用CLI或IW服務，因為這些選項在GUI中不可用。

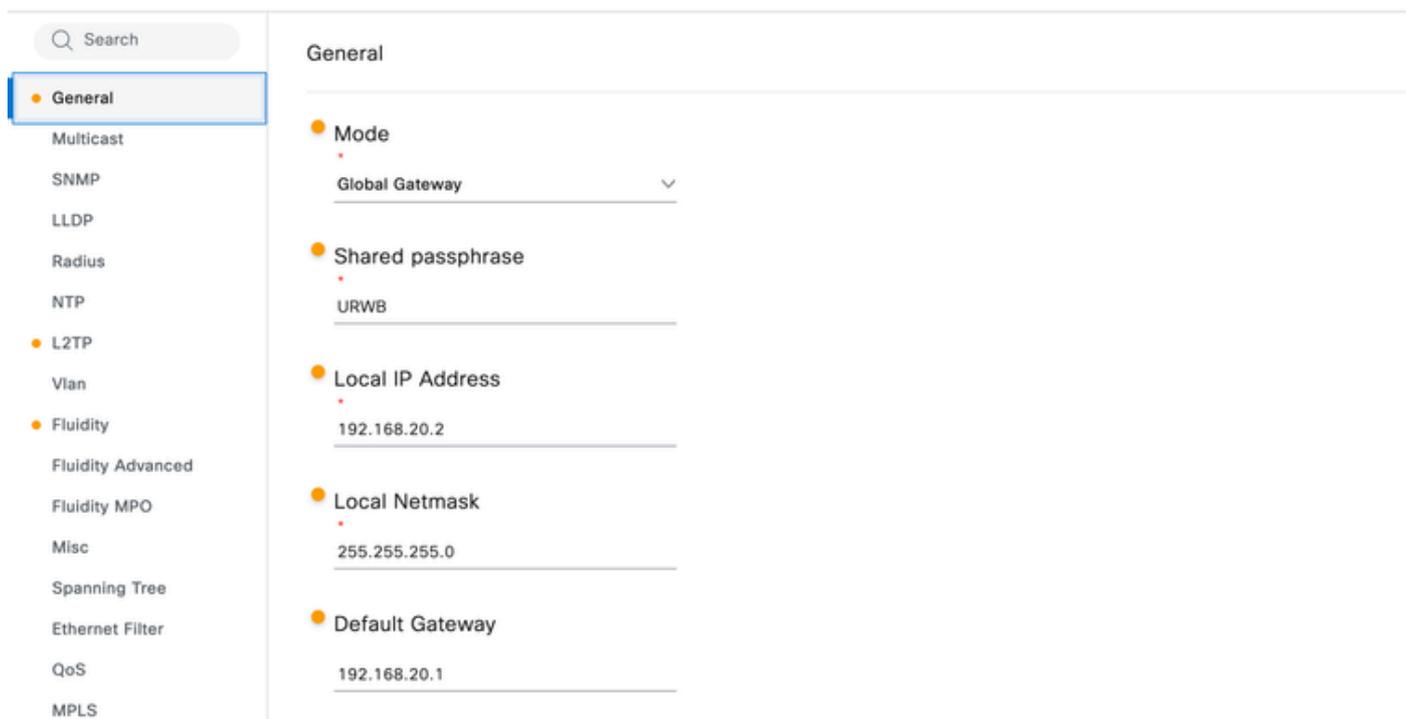
在IoT OD中通過IW服務配置第3層流動性

配置全域性網關

1. 在「一般資訊」部分中，必須選擇「模式」作為全域性網關，並且需要配置共用口令、本地

IP地址、本地網路掩碼和預設網關。

Edit Device Configuration

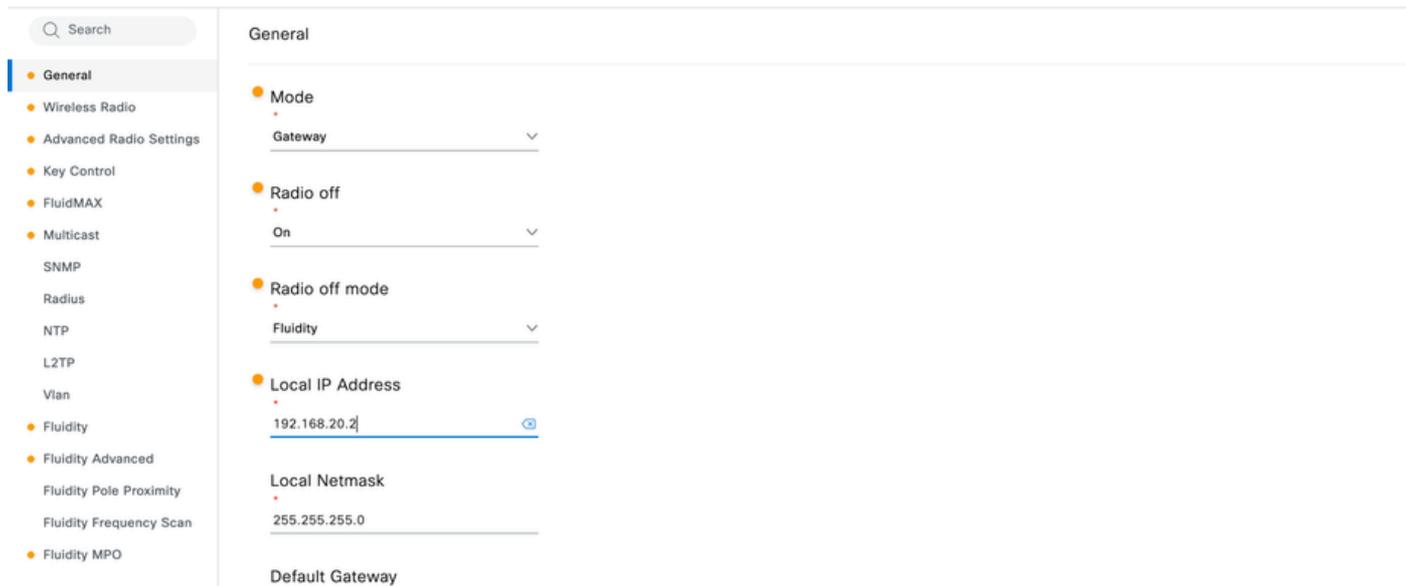


General

- 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

當將IW916X無線電配置為網關時，請注意，無線電關閉將自動啟用，無線電關閉模式需要是流動性。

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網路掩碼、WAN網關、埠。需要配置。同時，需要新增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. 最後，需要啟用「流動性」且「裝置」角色必須為「基礎結構」，而網路型別必須為多個子網

o

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' page for Fluidity. The left sidebar contains a search bar and a list of configuration categories: General, Multicast, SNMP, LLDP, Radius, NTP, L2TP, Vlan, Fluidity (selected), Fluidity Advanced, Fluidity MPO, Misc, Spanning Tree, Ethernet Filter, QoS, and MPLS. The main content area is titled 'Fluidity' and contains three sections: 'Unit Role' with a dropdown menu set to 'Infrastructure', 'Network Type' with a dropdown menu set to 'Multiple subnet', and 'Enable Primary Pseudowire Enforcement' with a dropdown menu set to 'Disable'.

配置跟蹤端無線電：

1. 在「一般資訊」部分中，必須選擇「模式」作為「網狀結束」，並且需要配置共用口令、本地 IP 地址、本地網路掩碼和預設網關。

附註：但對於網格點軌跡邊無線電而言，模式將是「網格點」

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' page for Wireless Radio settings. The left sidebar contains a search bar and a list of configuration categories: General (selected), Wireless Radio, Advanced Radio Settings, Key Control, FluidMAX, Multicast, SNMP, Radius, NTP, L2TP, Vlan, Fluidity, Fluidity Advanced, Fluidity Pole Proximity, Fluidity Frequency Scan, and Fluidity MPO. The main content area is titled 'Wireless Radio' and contains several sections: 'Mode' with a dropdown menu set to 'Mesh End', 'Radio off' with a dropdown menu set to 'Off', 'Radio off mode' with a dropdown menu set to 'Parameter disabled', 'Local IP Address' with a text input field containing '10.122.136.50', 'Local Netmask' with a text input field containing '255.255.255.192', and 'Default Gateway' with a text input field containing '10.122.136.1'.

2. 在 Wireless Radio Section，Passphrase，Radio Interface（您要使用它來與車輛通訊），需要配置頻率和口令

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網路掩碼、WAN網關、埠。需要配置。同時，需要新增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 settings. 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 the 'L2TP Tunnels' section, which contains two tunnel configuration boxes. Each box has two fields: '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 to the right of each box.

4. 最後，需要啟用流動性，裝置角色必須是基礎設施，而網路型別必須是多個子網

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 a checkbox that is currently unchecked.

配置車輛無線電

1. 在「一般資訊」部分中，必須選擇「模式」作為「網狀結束」，並且需要配置共用口令、本地 IP 地址、本地網路掩碼和預設網關。

Edit Device Configuration

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 (您要使用它來與跟蹤端通訊) , 需要配置頻率和口令

Edit Device Configuration

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. 最後，需要啟用「流動性」，且「單位」角色必須為「車輛」，並且必須手動選擇「車輛ID」，同時網路型別必須為多個子網

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 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. 如果車載網路包含用於車載裝置或伺服器的多個子網，則必須在車載無線電上配置靜態路由。在此配置中，必須指定板載子網和網路掩碼，並將網關設定為板載路由器上的相應介面。

Edit Device Configuration

The screenshot shows the 'Edit Device Configuration' interface with the 'Static Routes' section selected in the left navigation menu. The main 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.

通過CLI配置第3層流動性

本節根據文章開頭顯示的拓撲概述了CURWB裝置的CLI配置。假設在全域性網關、跟蹤端網狀網端和車輛上實施FastFail冗餘。有關特定的FastFail冗餘配置步驟，請參閱前面提到的文章。此處僅介紹特定於第3層流動性的VIP概念，並假設在所有所需的無線電上已配置FastFail。

配置全域性網關

將IEC6400配置為網關

```
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
```

將AP無線電配置為網關：

```
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
```

配置跟蹤端無線電

```
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

```

配置車輛無線電。

```

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

```

交換機/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
```

板載路由器配置：

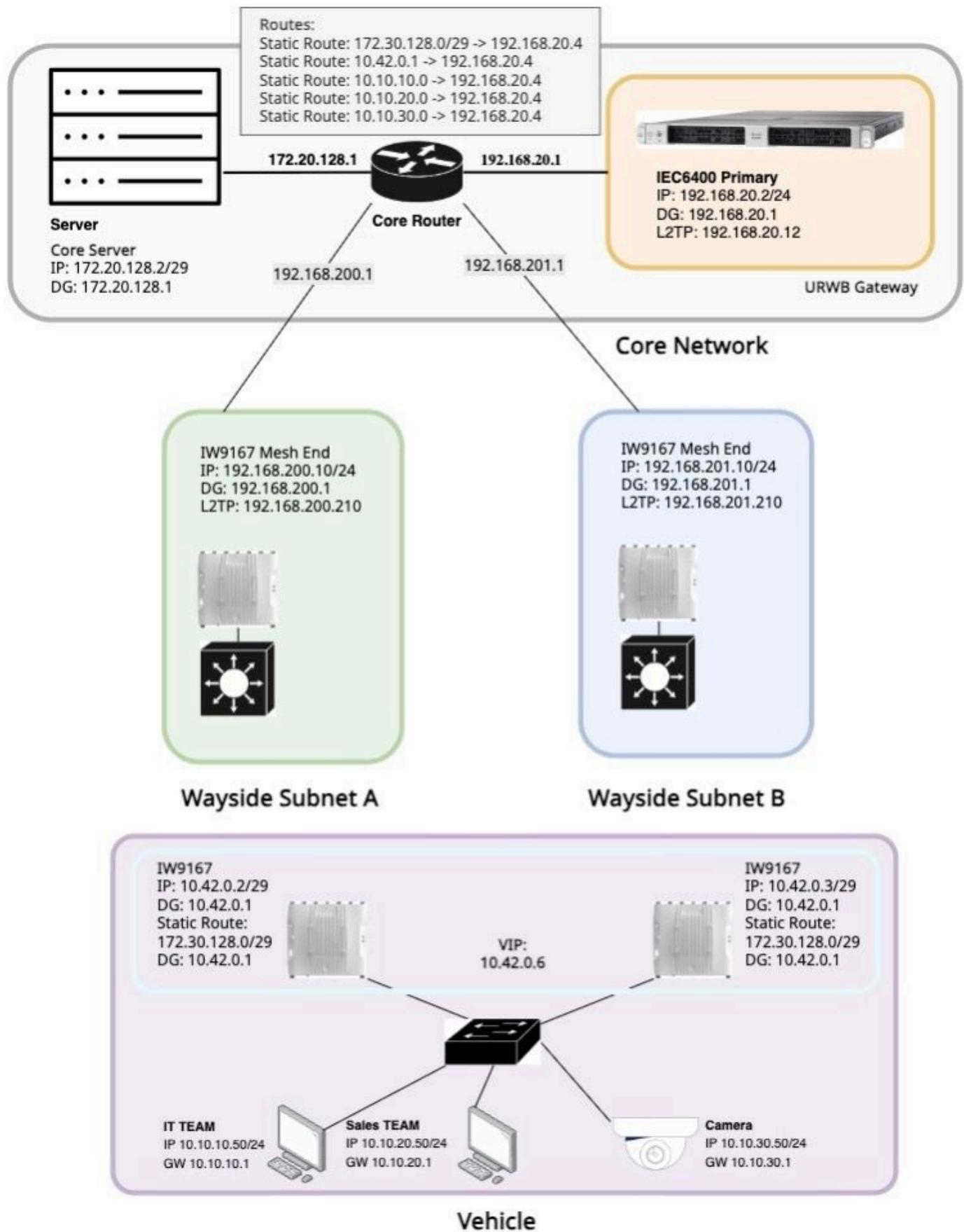
```
configure terminal
ip route 0.0.0.0 0.0.0.0 10.42.0.6
exit
write
```

板載網路的CURWB L3變體

板載託管L2交換機，無路由器

- 此配置描述了混合第3層網路環境，其中移動車輛上存在中繼VLAN。
- 它適用於沒有車載路由器的車輛單元。
- 在此設定中：
 - 必須在車載無線電上配置VLAN。
 - 必須在所有基礎設施單元和全域性網關上禁用VLAN功能。
 - 此方法有助於保持本地子網與核心網路之間的連通性。
 - 附註：在此應用中，板載射頻不會取代通常負責標準第3層流拓撲中VLAN間路由的第3層裝置。

無板載路由器時第3層流動性的網路拓撲變化



板載交換機的配置

```
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

板載無線電配置

- VLAN必須僅在沒有車載路由器的車輛單元上啟用。

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

- 新增靜態路由非常重要，這樣車輛裝置就可以將本地子網通告給全域性網關。子網的網關是用於2個板載無線電的虛擬IP。如果是單個無線電，則必須將該無線電的IP地址用作網關。

```
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第3層網路故障排除：

在流動性L3網路場景中，L2TP隧道狀態是需要檢查的最重要設定之一；事實上，通向處於IDLE或WAIT狀態或未正確配置的集群的L2TP隧道會在車輛連線到該特定集群時阻止車輛和主幹之間的通訊。

檢查通道狀態的簡單方法是前往CLI並執行「show l2tp」或從GUI檢查狀態。

L2TP通道驗證

- L2TP頁面顯示當前的L2TP隧道及其狀態(CONN、WAIT、IDLE)。
- 當兩個網狀終端都啟動並運行時，在主網狀終端上，L2TP狀態將處於CONN狀態，而在輔助網狀終端上，L2TP狀態將處於IDLE狀態。如果由於配置錯誤或物理問題導致通道出現連線問題，我將等待
- 如果需要，可以在此處檢查當前狀態並刪除已安裝的L2TP隧道。
- WAN IP地址對於每台裝置的L2TP配置是唯一的，並且必須與裝置的管理IP地址不同。

L2TP狀態摘要

- 每個全域性網關與每個遠端Mesh端建立L2TP隧道
- 每個集群網狀終端與全域性網關建立L2TP隧道

如果系統處於正常狀態（所有裝置都已啟動並正在運行），則這是全域性網關與每個L3流量跟蹤端群集之間的預期場景：

- 主全域性網關和主網狀終端之間的L2TP隧道 — CONN
- 主全域性網關和輔助網狀終端之間的L2TP隧道 — IDLE
- 輔助全域性網關和主網狀終端之間的L2TP隧道 — IDLE
- 輔助全域性網關和輔助網狀終端之間的L2TP隧道 — IDLE

典型配置問題/要檢查的事項

- 在同一裝置的多個介面上使用相同的IP、WAN IP或虛擬IP。
- 配置的遠端IP地址不正確；裝置指向的IP不是遠端裝置的正確WAN IP。

- 重複的WAN IP;同一集群內的兩個網狀端使用相同的WAN IP進行配置。
- 配置為通過未連線到網路的乙太網埠建立的隧道。
- UDP連線埠不相符；本地裝置和遠端對等裝置使用不同的UDP埠進行流量封裝。

關於此翻譯

思科已使用電腦和人工技術翻譯本文件，讓全世界的使用者能夠以自己的語言理解支援內容。請注意，即使是最佳機器翻譯，也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準確度概不負責，並建議一律查看原始英文文件（提供連結）。