

ML-N PTP Mesh wireless Hi-mobile multipath transmission system



- Point to point hi-mobile wireless transmission system dedicated
- Support vehicle mobile speed (max) > 200Km/h
- Hi-mobile transmission bandwidth > TCP 100Mbps
- Hi-mobile fastest seamless handover < 10ms
- Support multi-module、multi-frequency、multi-connection to transmit by best multipath transmission function



Model:

ML-N-1

ML-N-2

ML-N-3

- In wireless transmission, import point to point wired network transmission technology design
- Standard with: support 4.9 ~ 6.1GHz single frequency network card module, providing 300Mbps data rate and up to 200Mbps bandwidth; up to support three card module design.
(Choose with: support 2.4 / 5.8GHz dual-band network card module)
- Support vehicle mobile speed (maximum) > 200Km/h
- Hi-mobile transmission bandwidth > TCP 100Mbps
- Hi-mobile fastest seamless handover < 10ms
- Support multi-module、multi-frequency、multi-connection to transmit by best multi-path transmission function
- Import point to point wired network transmission technology
- Point to Point Wireless Mesh multipath Hi-mobile networks, can automatically maintain redundant multipath connection, and automatically selects the best transmission path
- Support easy way of illustration, instantly rendering RSU node device connection status and OBU high-speed mobile wireless transmission node handoff connection status display



Product Highlights

➤ Import Point to Point Mesh multipath hi-mobile transmission technology

Based on a wired or wireless network backbone, import point to point Mesh multipath hi-mobile transmission technology that allows hi-mobile transmission into a mobile point to point transmission, combined Mesh automatic backup connection and the best path transmission technology, truly simple hi-mobile applications.

➤ Support multi-modules、multi-bands、multi-links to transmit by best multi-path transmission function

For wireless high-speed moving environment faced by connecting multiple changes, while the presence of radio frequency interference possibilities, ML-N product specially designed multi-module, multi-frequency, multi-connection function, in hi-mobile transmission can support multiple multi-frequency detection with multiple connections, and finally the best path by the mobile connection, perform the operation of hi-mobile transmission. So avoid the connection of single frequency signal instability or bad or disturbed interruptions.

➤ Faster speed, higher transmission bandwidth, lower seamless handover time

Point to point hi-mobile mesh wireless transmission system, support maximum moving speed > 200Km / h; high-speed travel, the transmission bandwidth > TCP 100Mbps; high-speed travel, the fastest seamless handover switching < 10ms, so that more hi-mobile transmission operating value.

➤ Special Mesh network mechanisms to enable wireless communications link adds redundancy and stability

Based on wireless mesh network systems and multi-module mesh wireless transmission system formed, introducing unique multipath Mesh network technology, wireless network system to achieve redundancy and automatic repair wiring and automatically determine the best path feature that lets the wireless transmission system operation more stable

➤ For a variety of entities wired network backbone and different wireless backhaul technical infrastructure

Design Point to Point Mesh Hi-mobile wired network technology can be easily adapted to entities wired network backbone and different wireless technologies to formed wireless backhaul network infrastructure. Including: fiber optic cable backbone network, wired Ethernet backbone, general wireless hops wireless backhaul ... and so on, can use Point to Point Mesh Hi-mobile wired network



technology to do hi-mobile transmission operation.

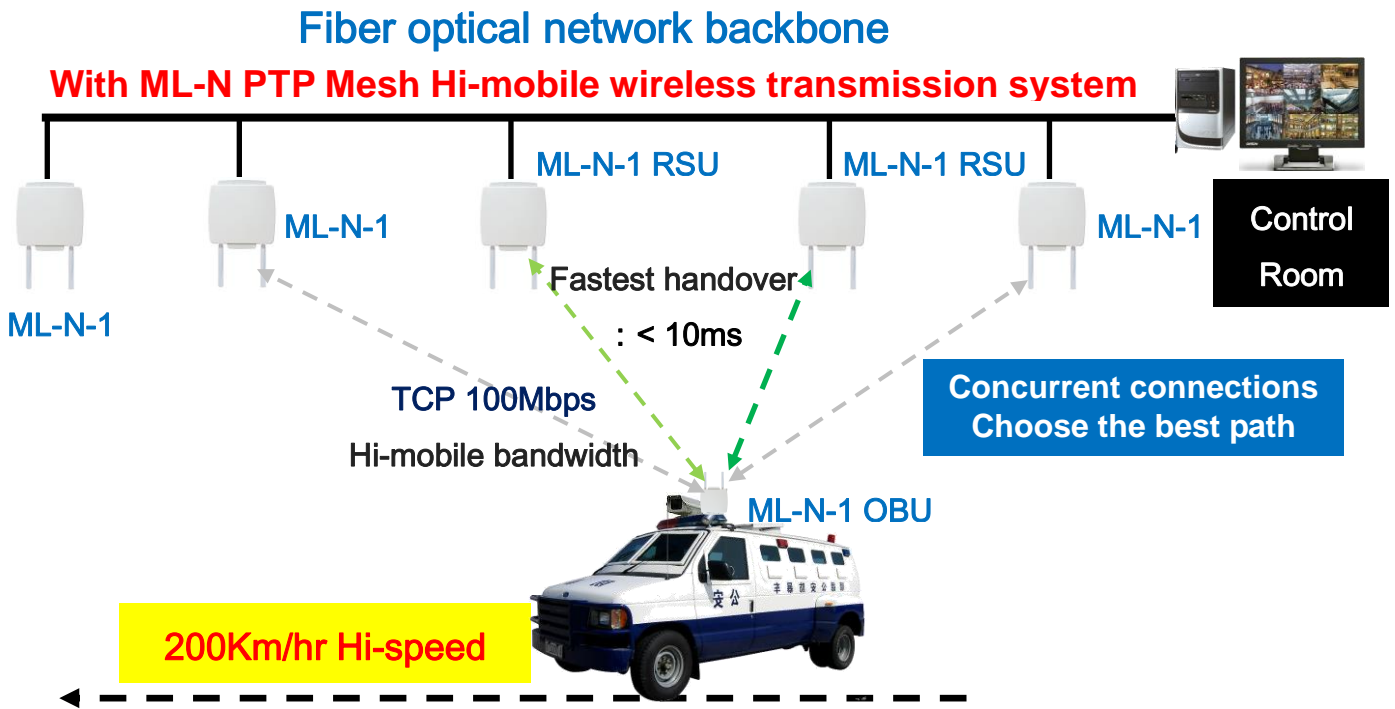
➤ Wireless Signal Interference Makes Resistance Ability Excellent

Support full RF module frequency band from 2.3~2.7GHz & 4.9~6.1GHz and greater use of the channel width, plus a specially designed proprietary tandem technology and Mesh wireless signal transmission pure point to point, will make radio signal interference ability more excellent performance.

(Default 5GHz 11a / n 2x2 MIMO mini PCI card)

ML-N architecture of hi-mobile transmission system diagram

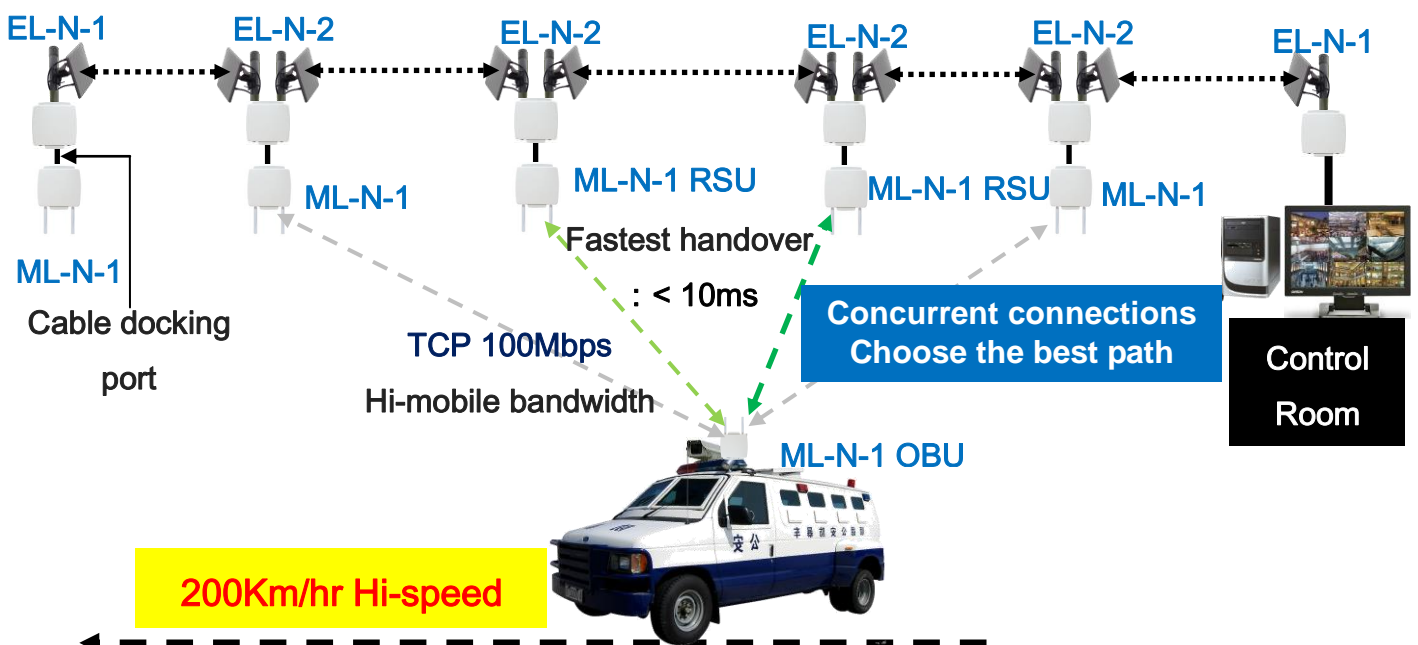
1. Fiber optical network backbone / general cable network backbone



2. EL-N PTP Mesh wireless network backbone

EL-N PTP Mesh wireless network backbone

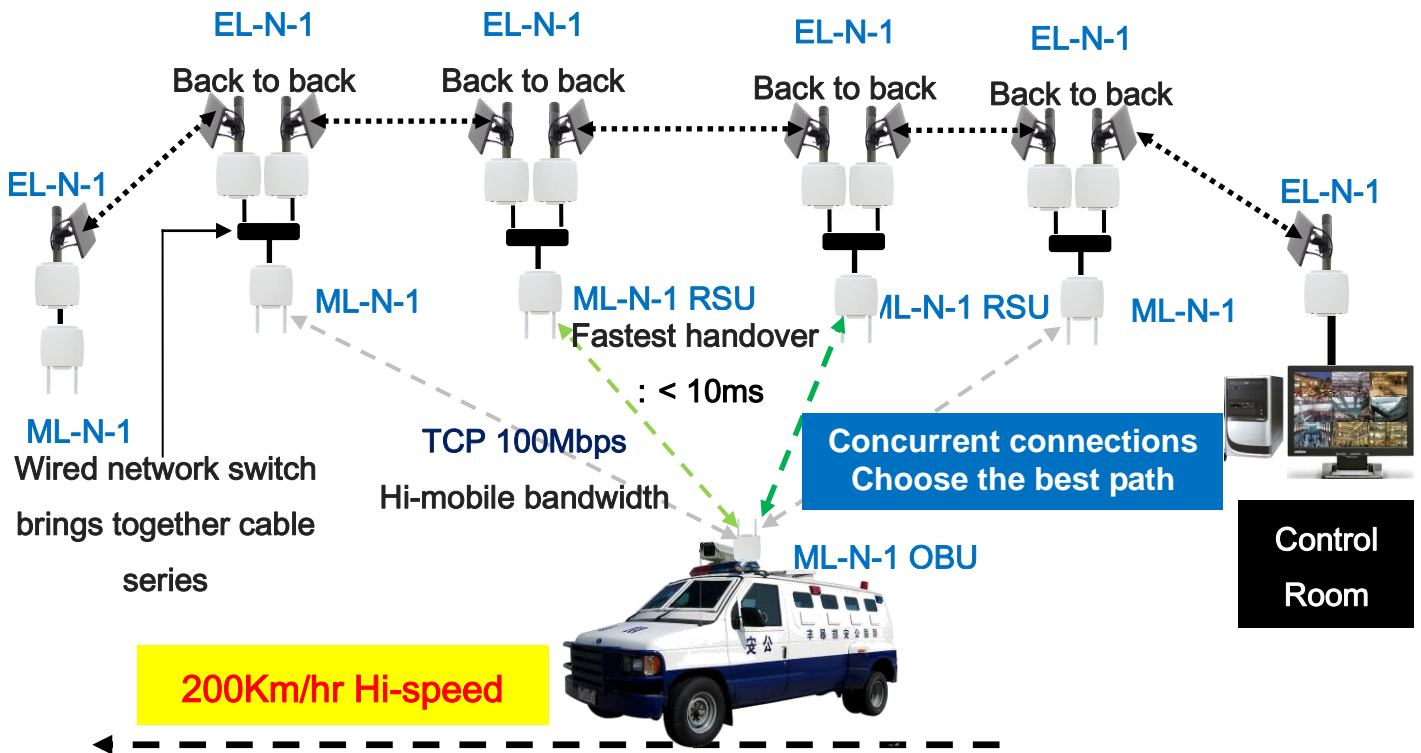
(EL-N wireless system can solve network broadcast storms and packet issues)



3. EL-N Series back to back wireless network backbone

EL-N-1 back to back wireless network backbone

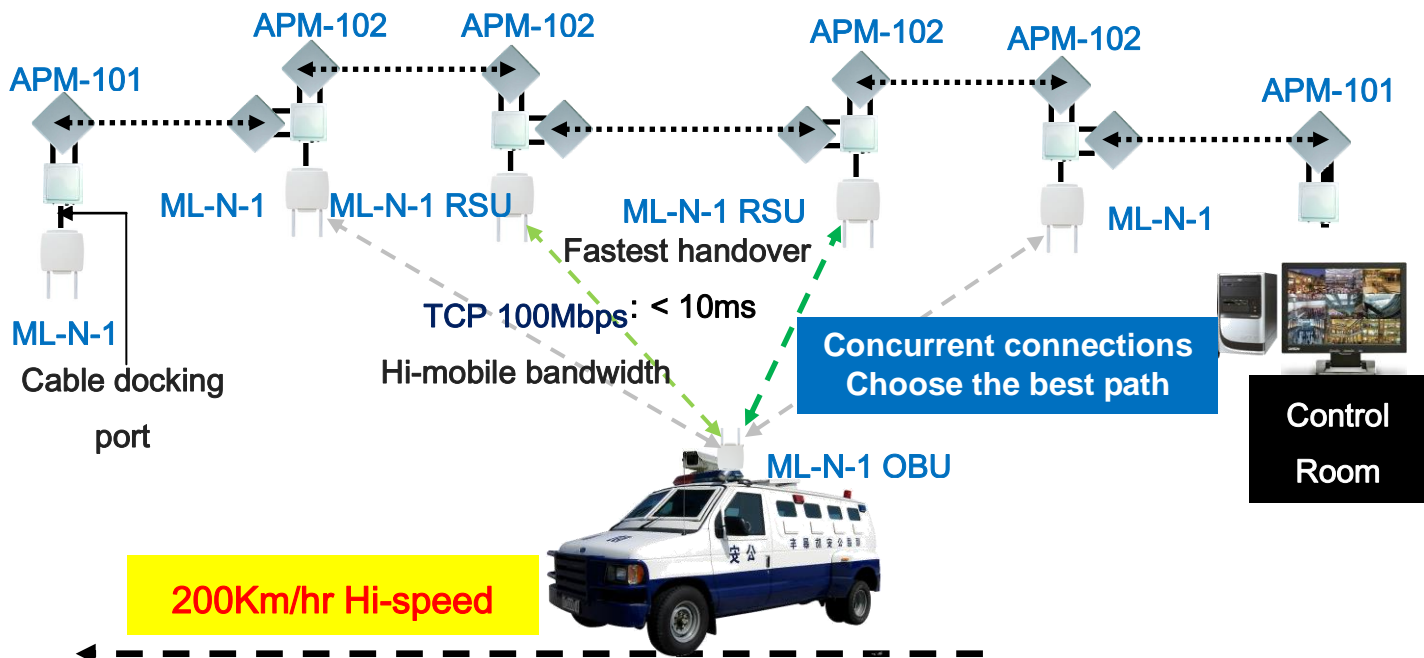
(EL-N-1 wireless system can solve network broadcast storms and packet issues)



4. APM-100 series multiple hops wireless backbone / general wireless devices back to back wireless backbone

APM-100 series multiple hops wireless backbone

With ML-N Mesh Hi-mobile wireless transmission system



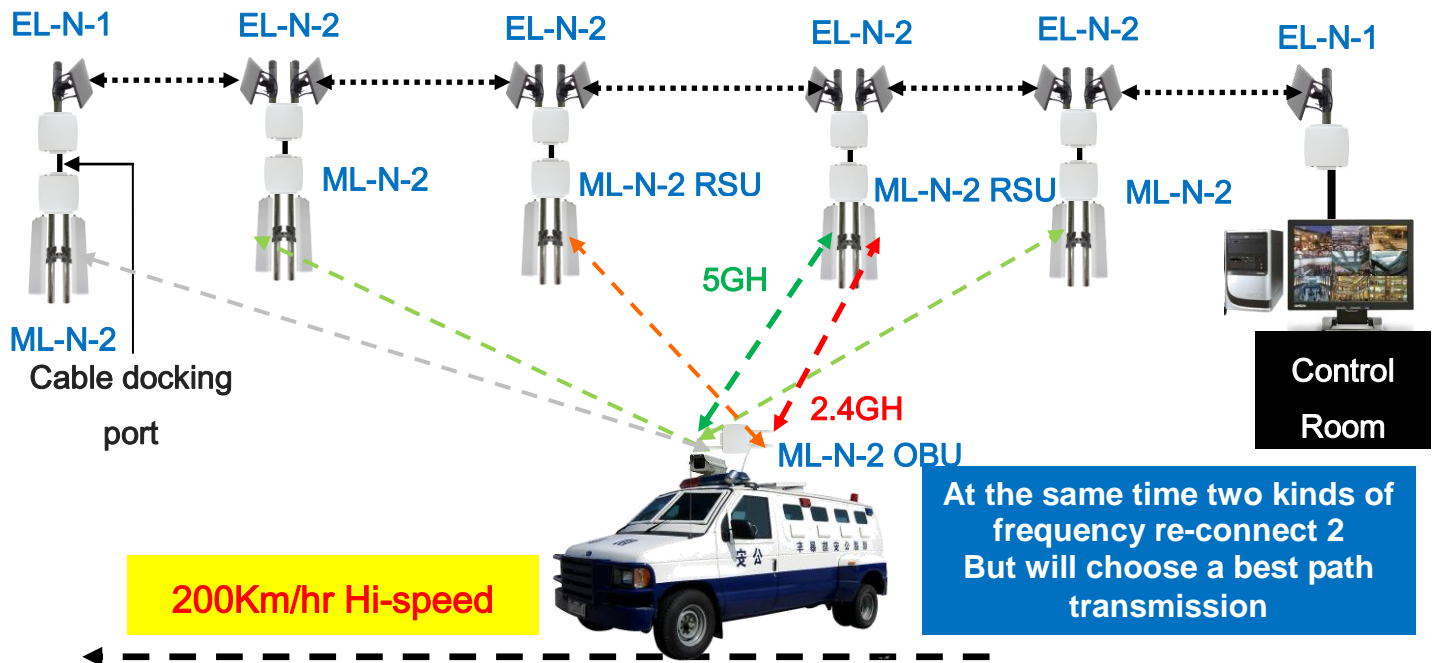
■ **ML-N architecture of Hi-mobile multi-interface module, a variety of radio frequency, multi-connection transmission system diagram:**

- **ML-N-2 to set up two interface modules, 2.4 & 5GHz dual band wireless frequency & two kinds Mesh connection, perform fast seamless handover transmission of high-speed mesh mobile**

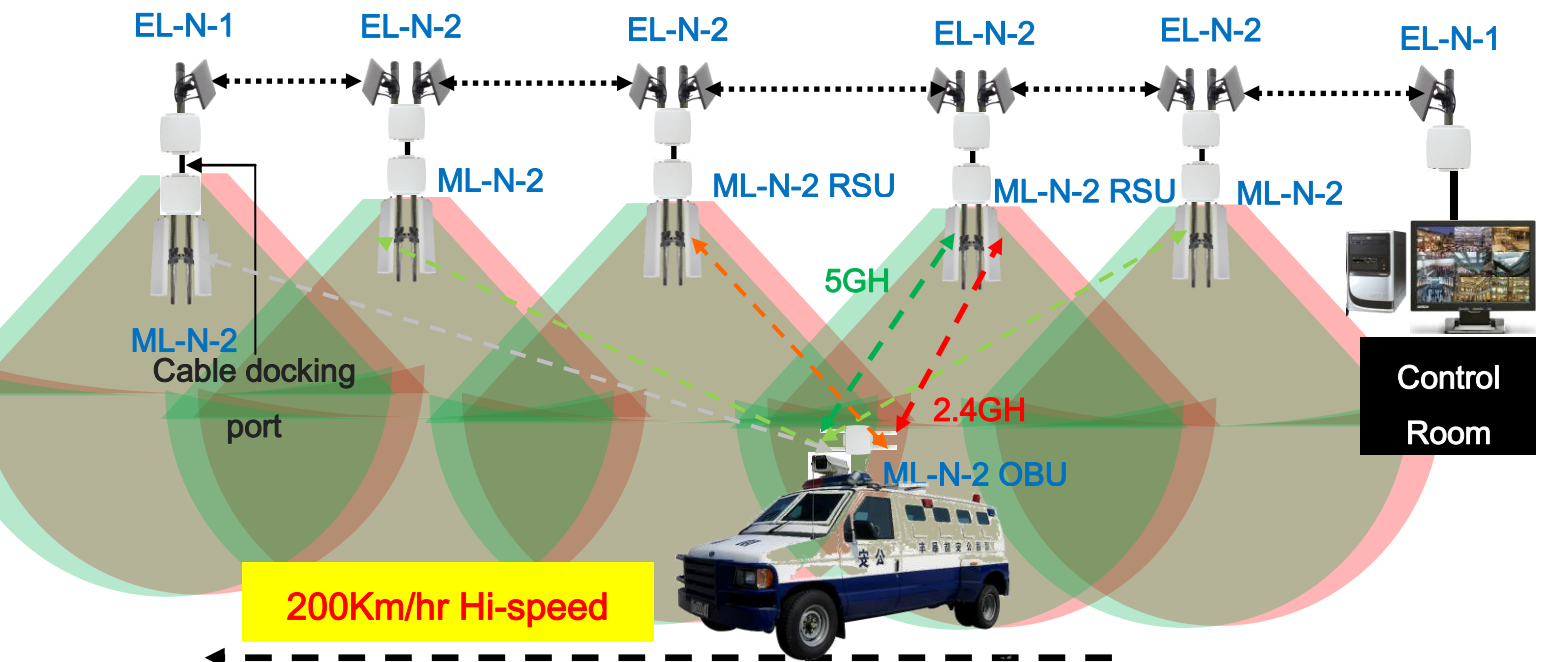
EL-N PTP Mesh wireless network backbone

With ML-N Mesh high-speed Hi-mobile wireless transmission system

2 module to work 2.4 & 5GHz dual band wireless frequency for 2 kinds Mesh Hi-mobile connection



- **2.4GHz & 5GHz with two different radio frequencies overlap of the wireless signal coverage**





Product Specification

Hardware Specification

Key Components	
Main Processor	Atheros AR7161 (680Mhz)
Wireless Chipset	<ol style="list-style-type: none"> Standard with: Atheros AR9220 mini PCI,IEEE 802.11 a/n,2T2R MIMO, 300Mbps Optional with: Atheros AR9220 mini PCI,IEEE 802.11 a/g/n,2T2R MIMO, 300Mbps
Switch Controller	Atheros AR8035
Flash Memory	16MBytes
SDRAM	128MBytes
Interfaces Specifications	
Wireless RF Module	<ol style="list-style-type: none"> Standard with:RFS5-M22M Atheros AR9220 mini PCI, Output Power 25dBm Max, IEEE 802.11 a/n, 2T2R MIMO, 300Mbps. Optional with:DNMA-H92 Atheros AR9220 mini PCI, Output Power 23dBm Max, IEEE 802.11 a/g/n, 2T2R MIMO, 300Mbps. Product Model Number and built in Wireless RF module: ML-N-1: 1 Wireless RF Module ML-N-2: 2 Wireless RF Modules ML-N-3: 3 Wireless RF Modules
Wireless Frequency	<ol style="list-style-type: none"> Standard with:RFS5-M22M IEEE 802.11 a/n,5.8GHz (4.9~6GHz). Optional with:DNMA-H92 2.4GHz / 5.8GHz (2.3~2.7/4.9~6.1GHz).
Frequency Bandwidth	10MHz / 20MHz / 40 MHz
Wireless Module Interface	ML-N-1: 2 x N-type Female Connectors ML-N-2: 4 x N-type Female Connectors ML-N-3: 6 x N-type Female Connectors
Ethernet Interface	<ol style="list-style-type: none"> Group 1 wired network port: Support 10/100/1000Mbps RJ-45 port, Compatible with:IEEE802.3/802.3i/802.3u;and support 802.3af/3at Passive PoE PD mode Group 2 wired network port: Support 10/100/1000Mbps RJ-45 port, Compatible with: IEEE802.3/802.3i/802.3u (Optional) Ethernet Network Port:Support10/100/1000Mbps , based on 10BASE-T,100BASE-T,1000BASE-T and Half-duplex / Full-duplex / Half & Full-duplex and support Auto negotiation



I/O Interface	RS-232 (PCBA onboard)
Ethernet Surge Protect Interface	Interface : Ethernet RJ-45 Female Port Supports Ethernet lightning surge protection up to 10KA

Standard with:RFS5-M22M IEEE 802.11 a/n, 2T2R MIMO, Data Rate 300Mbps

IEEE 802.11a

802.11a RF Module 5150 ~ 5745MHz 5805 ~ 5825MHz	Data Rate	Output Power	Rx Sensitivity
	6Mbps	25dBm	-95dBm
	9Mbps	25dBm	-95dBm
	12Mbps	25dBm	-94dBm
	18Mbps	25dBm	-91dBm
	24Mbps	25dBm	-88dBm
	36Mbps	24dBm	-85dBm
	48Mbps	23dBm	-81dBm
	54Mbps	23dBm	-79dBm

Index MCS	IEEE 802.11an /HT20				IEEE 802.11an /HT40			
	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity
	GI=800ns	GI=400ns			GI=800ns	GI=400ns		
MCS8	13	14.4	25	-94 dBm	27	30	25	-90 dBm
MCS9	26	28.9	25	-92 dBm	54	60	25	-89 dBm
MCS10	39	43.3	25	-90 dBm	81	90	25	-87 dBm
MCS11	52	57.8	24	-87 dBm	108	120	24	-83 dBm
MCS12	78	86.7	23	-84 dBm	162	180	23	-80 dBm
MCS13	104	115.6	23	-80 dBm	216	240	23	-77 dBm
MCS14	117	130.3	23	-78 dBm	242	270	23	-75 dBm
MCS15	130	144.4	23	-76 dBm	270	300	23	-73 dBm

Note: Output Power +- 1.5dBm



Power Requirement

Power Supply	<ol style="list-style-type: none"> Support AC100~260V 1.2~2.0A 50/60Hz adapter, output 12~28Vdc 4.0A above With IEEE 802.3af/3at Passive mode PoE-PSE , output 48Vdc 1.5A 72W Max With the product has AC 100 ~ 240V / 1.2A ~ 2.0A to DC DC 19V / 4.7A adapter
Power over Ethernet PD	Support IEEE 802.3af/3at Passive mode PoE PD 48Vdc 1A max
PCBA power-receiving terminal (optional)	Support DC Jack 2.1mm receiving connector, power supply required 12Vdc 4A (inclusive) or more, through the second waterproof head access to power input connector
Power consumption of equipment (including PoE power supply)	<ol style="list-style-type: none"> ML-N-1: 6W/H, 100Mbps Full Speed 8W/H max, Start on 12W max ML-N-2: 8W/H, 200Mbps Full Speed 10W/H max, Start on 16W max ML-N-3: 10W/H, 300Mbps Full Speed 12W/H max, Start on 20W max <p>Use the PoE to power supply, please use the IEEE 802.3at 48Vdc 1A above Passive mode PoE PSE.</p>

Physical Size and Weight

Size	260mm * 250mm * 80mm
Weight	ML-N-1/2/3 weight 1.8Kg / 1.9Kg / 2.0Kg Product packaging (including accessories & PoE Injector) 4.0Kg, Shipping cartons 4 box total is 16Kg

Environmental Tolerable Specifications

Operation temperature	-30 ~ 70°C
Humidity	0% ~ 95% Non-condensing
Storage temperature range	-40~ 85°C
Waterproof and dustproof	Outdoor IP68 rated

Product Certification

Certification	FCC NCC (Taiwan) BSMI (Taiwan)
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Software Specification

Network Switching Software Function	
Network Bridging Functionality	<ol style="list-style-type: none"> 1. Mesh network data transmission with Data Link Layer interface of OSI (Open System Interconnection Reference Model) Layer 2 data Link & Layer 3 to achieve fast data transfer and automatic healing links to reduce selection path delay And multi-hop relay bandwidth attenuation, to provide more than 100Mbps after 16 hops of bandwidth. 2. PTP Mesh Private enclosed wireless backhaul transmission system technology 3. 3. Design of Mesh Link ID point-to-point Mesh Hi-mobile multi-path hi- mobile transmission network, users do not need complex system settings; you can perform wireless point-to-point multi-path hi-mobile hand over transfer.
Wireless Device Operation	
System Operation Mode	Using RSU (Road Side Unit) wireless base station signal coverage, with OBU (On Board Unit) mobile point equipment, point-to-point connection hi-mobile hands-over operation.
Wireless Operation Multi-mode and Multi Transmission Interface Operation	Support wireless network dynamic multi-mode export interface distribution, according to operational needs to switch to set the RSU or OBU mode of operation to meet the hi-mobile signal coverage and mobile connection needs of different roles.
PTP Mesh Hi-mobile Point-to-Point Wireless Backhaul System	<ol style="list-style-type: none"> 1. Can use the wired backhaul mode (wired network, fiber network ... etc), with RSU (Road Side Unit) roadside erection of wireless signal coverage, to achieve wireless hi-mobile transmission system operation; suitable for use in rail transport systems, public transport system, highway system, general road system. 2. You can use the "upper wireless backhaul network mode (multi-point wireless hops platform backhaul)", with "lower layer RSU (Road Side Unit) roadside erection of wireless signal coverage" to achieve wireless hi-mobile transmission system operation.

<p>PTP Mesh Hi-mobile Point-to-Point Wireless Transmission System Performance</p>	<ol style="list-style-type: none"> 1. Support the highest moving speed: > 200Km / hr hi-mobile operation of vehicle equipment. 2. Support the hi-mobile highest performance: > TCP 100Mbps wireless network transmission bandwidth. 3. Support the hi-mobile fastest switch under: <10ms of the very short time hand over transfer. 4. Support automatically finds the best transmission path 5. With automatic update system node message function 6. Fast Transparent Forwarding. 7. With multi-module, multi-frequency, multi-connection of the best path transmission functions, to achieve a high degree of transmission connection to meet the requirements of resistance to complex environments.
<p>Support Wireless Parameter Adjustment Function</p>	<p>Support channel / transmission power / data rate (ML-N series) / maximum distance parameter adjustment settings, in order to improve the stability of the transmission link.</p>
<p>Support for Hi-mobile Instant Connection Status Display</p>	<ol style="list-style-type: none"> 1. Support simple icon mode, instantly show RSU node device connection status and OBU hi-mobile node hand over wireless transmission connection status display. 2. Support the instant update of the connection icon and connection data update and by capturing the connection data archive, in order to facilitate the subsequent analysis of the connection signal tuning reference.
<p>Data Security Encryption and Device Security Management</p>	
<p>Data Security Encryption</p>	<ol style="list-style-type: none"> 1. PTP Mesh Hi-mobile network system is private system. Work with closed wireless transmission system security features. 2. Wireless group security mechanism with system Link ID (default Link ID is ML-N Link)
<p>Equipment Safety Management</p>	<ol style="list-style-type: none"> 1. With the operation interface of the account secret input set security function 2. Firmware software update: dual backup design. 3. The core software authentication encryption, the use of random matrix encryption technology. 4. The mutual authentication mechanism between the device and the central end (in development), and the interoperable devices between different vendors. <p>(PC installs on authentication software or export-side equipment to play-Root, multiple Root, the system can mutual backup).</p>
<p>System management and system maintenance function</p>	



System Management Functions	<ol style="list-style-type: none"> 1. Manage the HTTP (s) WEB GUI through a web browser. 2. Support management VLAN tag. 3. Supports dual configuration files / Factory Defaults. 4. Support multi-level management Multiple Level Management.
System Maintenance Functions	<ol style="list-style-type: none"> 1. Software support Hardware Watchdog. 2. To provide dedicated simple system network management software (under development). 3. Optional SNMPv2c / v3, standard / private MIBs are supported (optional). 4. To provide customized ODM modification, configuration, management. 5. Support firmware files for dual backup. 6. Support firmware upgrade / firmware file rewrite back (downgrade).
System construction erection of auxiliary tools	
Wireless Connection Signal Scanning and Connection Status Assistance Tools	Support dynamic wireless signal and transmission rate and flow display icon to facilitate the wireless engineering and technical personnel to determine the stability of the wireless system

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Package Contents

1. IO-Power Outdoor ML-N Series PTP Mesh Hi-mobile Wireless Network System (IOP-ML-N-1/2/3 Series)
2. Passive mode PoE-PSE Power over Ethernet Injector (48Vdc 1.5A Max)
3. AC 100 ~ 240V / 1.2A ~ 2.0A to DC 19V / 4.7A adapter
4. AC Code 1.5 meter power cord
5. Rod-type / wall-mounted bracket and U-shaped screws and set screws

If any of the above items are missing, please contact your reseller.



>>>> Select with 2.4GHz & 5.8GHz dual-band Wireless RF module recommendations:

1. For the frequency of 5GHz is covered by other wireless strong interference or suffer serious wireless signal interference or other special interference, need to replace and use of 2.4GHz frequency of the project application requirements, it is recommended to choose the dual-band wireless RF module.

2. For special transmission application requirements (such as military or hospital area wireless transmission), if necessary, take the choice of dual-band wireless RF module.

Note 1: Choose the high-power dual-band wireless RF card module, will add double power consumption than the high-power single-frequency wireless RF card module.

Note 2: Choice the high-power dual-band wireless RF card module, will add 10°C ~ 15°C the temperature than the high-power single-frequency wireless RF card module.

Optional with: DNMA-H92 IEEE 802.11 a/g/n, 2T2R MIMO, Data Rate 300Mbps

IEEE 802.11g

11g RF 2300 ~ 2700MHz Data Rate Output Power Rx Sensitivity	Data Rate	Output Power	Rx Sensitivity
	6Mbps	25dBm	-95dBm
	9Mbps	25dBm	-95dBm
	12Mbps	24dBm	-94dBm
	18Mbps	24dBm	-93dBm
	24Mbps	23dBm	-89dBm
	36Mbps	23dBm	-86dBm
	48Mbps	22dBm	-82dBm
	54Mbps	22dBm	-81dBm

IEEE 802.11a

11a RF 5150 ~ 5745MHz 5805 ~ 5825MHz Data Rate Output Power Rx Sensitivity	Data Rate	Output Power	Rx Sensitivity
	6Mbps	24dBm	-95dBm
	9Mbps	24dBm	-93dBm
	12Mbps	23dBm	-91dBm
	18Mbps	23dBm	-89dBm
	24Mbps	22dBm	-85dBm
	36Mbps	22dBm	-82dBm



			48Mbps	21dBm			-79dBm	
			54Mbps	21dBm			-75dBm	
Index MCS	IEEE 802.11gn /HT20				IEEE 802.11gn /HT40			
	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity
	GI=800ns	GI=400ns			GI=800ns	GI=400ns		
MCS8	13	14.4	25	-95 dBm	27	30	24	-90 dBm
MCS9	26	28.9	25	-94 dBm	54	60	24	-90 dBm
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MCS15	130	144.4	21	-78 dBm	270	300	20	-74 dBm
Index MCS	IEEE 802.11an /HT20				IEEE 802.11an /HT40			
	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity	Data Rate (Mbps)		Output Power dBm	Rx Sensitivity
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Note: Output Power +- 1.5dBm