Cisco IR510 WPAN Industrial Router

Product overview

The Cisco® IR510 WPAN Industrial Router provides unlicensed 902-928MHz, ISM-band IEEE 802.15.4g/e/v Wireless Personal-Area Network (WPAN) communications to diverse Internet of things (IoT) applications. As the next generation of the DA gateway, besides supporting the IoT use cases of smart grid, Distribution Automation (DA), and Supervisory Control and Data Acquisition (SCADA), it also provides higher throughput, distributed intelligence, GPS, enhanced security. The router supplies enterprise-class RF mesh connectivity to IPv4, IPv6 and RS-232 serial IoT devices, including recloser controllers, capacitor bank controllers, voltage regulator controllers, regulators, distribution line monitors and other Remote Terminal Units (RTUs). Purpose-built to withstand outdoor harsh environments, the IR510 is ideal for installations in pad-mount and pole-mount cabinets and in other demanding locations.

The IR510 takes full advantage of world class Cisco networking expertise in IPv6, security, legacy protocol transport and network management, fog computing. It provides an open RF mesh solution based on the following standards:

- IEEE 802.15.4 g/e/v
- IETF 6LoWPAN
- IETF Routing Protocol for Low Power and Lossy Networks (RPL)
- IETF Mapping of Address and Port - Translation (MAP-T)
- IETF Constrained Application Protocol (CoAP)

Figure 1 displays a Cisco WPAN Industrial Router IR510.

Figure 1.   Cisco IR510

Solution overview

The IR510 is a component of the Cisco Industrial IoT Field Area Network (FAN) Solution, which meets these challenges using designs from the industry-leading Cisco GridBlocks™ Architecture. A typical communications network for the distribution grid is a two-tier architecture with a Neighborhood Area Network (NAN) and a Wide Area Network (WAN).

The NAN connects endpoints, such as DA devices, sensors, and smart meters, using a DA gateway or an embedded IPv6-based communications reference design's device. The endpoints form a mesh network based on IEEE 802.15.4g/e/v RF or IEEE 1901.2a narrow band Power-Line Communications (PLC) technologies. The mesh network is aggregated at an intelligent device such as a Field Area Router (FAR) mounted on pole tops or in secondary substations. The WAN tier provides network connectivity from the FAR to the utility's control center, over either a public cellular network or Ethernet fiber network.

The Cisco FAN solution comprises four important elements, as shown in Figure 2. They include:

- Cisco Resilient Mesh End point reference design, which provide CG-Mesh connectivity to end points such as DA devices, sensors and smart meters
- Cisco IR510 (DA gateway)
- Cisco 1000 Series Connected Grid Routers providing FAR capabilities
- Cisco ASR 1000 Series or CSR 1000v Aggregation Services Routers providing headend router (HER) capabilities
- Cisco IoT Field Network Director and Industrial Operations Kit for network management

Figure 2.   Cisco Industrial IoT Field Area Network Solution for DA applications
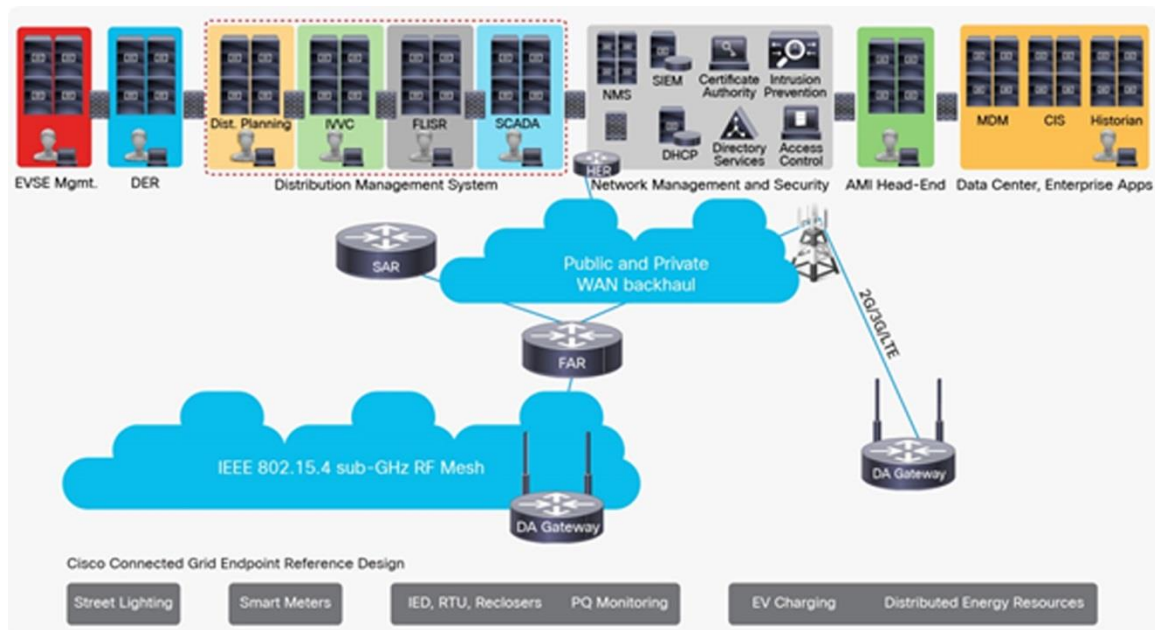
Key benefits

- Lowers Total Cost of Ownership (TCO) by consolidating disparate communications networks used for Advanced Metering Infrastructure (AMI) and DA applications
- Address DA applications such as:
  - Self-healing grid and Fault Location Isolation Service Restoration (FLISR)
  - Volt/VAR monitoring and control (VVC)
  - Power quality monitoring and distribution grid sensing
  - Asset management
  - Outage management
- Delivers a communications platform for standards-based, interoperable smart grid and IoT applications using IP-based technologies and innovations
- Increases communications network uptime and grid availability, helps ensure message delivery through a rugged industrial hardware design and highly resilient solution architecture
- Improves visibility, availability, and reliability of the distribution grid through enterprise-class network
- Facilitates graceful migration and integration of legacy assets with support for several IoT-specific protocols
- Features a compact form factor and low-power design to support connectivity to a diverse set of IoT end devices
- Integrates into customers' existing IT and security solutions, reduces project costs, risks and eliminates the need for defining new IT processes

Cisco IR510 WPAN Industrial router features

Table 1 lists hardware specifications and Table 3 lists software features for the IR500.

Table 1. Cisco IR510 hardware specifications

Feature	IR510 Hardware Specifications
Dimensions (W x D x H)	5"W x 5.9"D x 1.75"H
Typical Weight Fully Configured	2.3 lbs. (1.04 kg)
Operating Temperature	-40°C to +70°C (-40°F to 158°F) with IEEE 1613 type test up to 85°C (185°F) for 16 hours
Typical Power Consumption or Dissipation	7 Watts, depending on configuration
IEEE 802.15.4 WPAN	IEEE 802.15.4g/e
Frequency Support	902-928 MHz (and subset of it to comply with national regulations) • North America- ISM: 902-928 MHz • Australia: 915-928 MHz • Brazil: 902-907.5, 915-928 MHz
RF Modulations and PHY Data Rates	Frequency Hopping Spread Spectrum (FHSS) OFDM: 31 channels in 902 – 928 MHz, 800kHz channel spacing. OFDM PHY data rates of 50 kbps, 200 kbps, 400 kbps, 800 kbps and 1200 kbps FHSS 2FSK 150 kbps: 64 channels in 902 – 928 MHz, 400 kHz channel spacing FHSS 2FSK 50 kbps: 129 channels in 902 – 928 MHz, 200 kHz channel spacing

Feature	IR510 Hardware Specifications
Average Conducted Transmitter Output Power	30 dBm typical at all FSK rates 28 dBm typical at 50 kbps and 200 kbps OFDM 27 dBm typical at 400 kbps OFDM 25 dBm typical at 800 kbps OFDM 24 dBm typical at 1200 kbps OFDM
Antenna Connector	RF Mesh QMA (female), GPS: SMA (female)
10/100 Fast Ethernet Copper Port (RJ-45)	1
RS 232/RS 485 Serial Port RS 232 Serial	1
Console Port (RJ-45 connector)	1
Digital Alarm Inputs	1
Integrated DC Power Supply Input Range	12, 24 and 48 VDC (nominal), 9.6-60 VDC (maximum)
Environmental Compliance	• IEC-61850-3 • IEEE1613 • C37.90 high-voltage impulse
Immunity	• EN61000-6-2 • EN61000-4-2 (ESD) • EN61000-4-3 (RF) • EN61000-4-4 (EFT) • EN61000-4-5 (SURGE) • EN61000-4-6 (CRF) • EN61000-4-11 (VDI) • EN 55024, CISPR 24 • EN 55035, CISPR 35 • EN61000-6-1
Emissions	• 47 CFR, Part 15 • RSS-247 • ICES-003 Class A • EN55032 Class A • CISPR32 Class A • AS/NZS 3548 Class A • VCCI V-3 • CNS 13438 • EN 300-386
Safety	• USA: UL 60950-1 • Canada: CAN/CSA C22.2 No. 60950-1 • Australia/New Zealand: AS/NZS 60950.1 • Rest of world: IEC 60950-1 • UL certified to UL/CSA 60950-1, 2nd Ed. • CB report to IEC60950-1, 2nd Ed., covering all group differences and national deviations

Table 2. Cisco IR510 software specifications

Feature	Software Specifications
PHY/MAC Layer	• IEEE 802.3 Ethernet 10/100 Mbps • RS232/RS485 Serial • IEEE 802.15.4g WPAN • IEEE 802.15.4e WPAN MAC extensions • 6LoWPAN – RFC 4919, 4944 and 6282
Network and Transport Layer	• IPv4 (RFC 791, 826, 1918) • IPv6 (RFC 2460) • UDP (RFC 768)/TCP (RFC 793)

Feature	Software Specifications

	• IETF Routing Protocol for Low Power and Lossy Networks (RPL) (RFC 6206, 6550, 6551, 6553, 6554, 6719)
	• NAT44 (RFC 1918 and 2663)
	• MAP-T (RFC 7599)
	• Adopted data rates:
	  ◦ 1200, 800, 400, 200, 50 kbps OFDM
	  ◦ 150 and 50 kbps 2FSK
	• Per hop latency of 14ms
	• Configurable leaf node
	• RPL storing and non-storing mode
	• Expand Static NAT entries

Application Features	• Raw Sockets support on serial ports (for transport of non-IP protocols such as DNP3 and other legacy serial protocols) • DHCPv6 (RFC 3315) for IPv6 address allocation • IETF Constrained Application Protocol (CoAP) for network management • Dying Gasp • Fog computing
Security	• Encryption: AES-128 (IEEE 802.11i for WPAN key management) • Authentication and authorization: IEEE 802.1x for WPAN authentication and encryption; X.509 certificate support with integration into customer's PKI • Hardware-based device identity: IEEE 802.1AR (hardware-ready) • Role-Based Access Control (RBAC) for device configuration • Secure boot loader and signed firmware images • Alarm on Ethernet port disconnect • Alarm on new MAC address detection • Option to disable Ethernet on port disconnection • Option to disable Ethernet on new MAC address detection
Quality of Service	• Classification and marking: Layer 3 - Differentiated Services Code Point (DSCP) • Congestion management: Priority Queuing (PQ) • DSCP based on source/destination IP address and TCP/UDP port, apply to strict priority scheduling • Priority scheduling • Rate limit on Ethernet

Table 3 lists the IR510 hardware product ID (PID)

Table 3.   Cisco IR510 Product ID

Item	Specification
IR510-OFDM-FCC/K9	IR510 with 915MHz-WPAN, 1 FE, 2 serial, utility-grade DC power. For All North and South America except Brazil
IR510-OFDM-BRZ/K9	IR510 with 915MHz-WPAN, 1 FE, 2 serial, utility-grade DC power. For Brazil
IR510-OFDM-ANZ/K9	IR510 with 915MHz-WPAN, 1 FE, 2 serial, utility-grade DC power. For Australia and New Zealand

Table 4 lists the antenna options for IR510.

Table 4.   Cisco IR500 antenna options

Item	Specification
ANT-WPAN-OD-OUT-N	• Omnidirectional antenna for 863 - 915 MHz WPAN • N male connector • Outdoor, direct mount to bulkhead N female lightning arrestor • 1.5 dBi gain
ANT-WPAN-OM-OUT-N	• Omnidirectional antenna for 902 - 928 MHz WPAN • N female connector • Outdoor, mast mount • 4 dBi gain
ANT-LPWA-DB-O-N-5	• Omnidirectional antenna for 863 - 928 MHz WPAN • N female connector • Outdoor, mast mount • 5.6 dBi gain
ANT-UN-MP-OUT-QMA	• Omnidirectional antenna for 863 - 928 MHz WPAN • 5 ft. (1.5 m) integrated cable with QMA male right angle connector • Outdoor, mount to horizontal flat surface • 2 dBi peak gain
ANT-GPS-OUT-TNC	• Active GPS antenna • Integrated cable with TNC male right angle connector • 4 dBi gain at zenith, 25 dB LNA gain

Table 5 lists the RF cable options for the IR510.

Table 5.   Cisco IR510 RF cable options

Item	Specification
Indoor Cable Options	
CAB-L240-10-Q-N	10-ft (3 m) Low Loss LMR 240 Cable with QMA and N Connectors
CAB-L240-15-Q-N	15-ft (4.5 m) Low Loss LMR 240 Cable with QMA and N Connectors
CAB-L240-20-Q-N	20-ft (6 m) Low Loss LMR 240 Cable with QMA and N Connectors
Outdoor Cable Options	
CAB-L400-5-N-N	5-ft (1.5 m) Low Loss LMR 400 Cable with N Connectors (straight to right angle)
CAB-L400-5-N-NS	5-ft (1.5 m) Low Loss LMR 600 Cable with N Connectors (straight to straight)
CAB-L400-20-N-N	20-ft (6 m) Low Loss LMR 400 Cable with N Connectors
CAB-L600-30-N-N	30-ft (9.14 m) Ultra Low Loss LMR 600 Cable with N Connectors

Table 6 lists additional accessories available for the IR510.

Table 6.   Additional Accessories for Cisco IR510

Item	Specification
CGR-LA-NF-NF	Lightning arrestor, N female to N female
ANT-ADPTR-Q-TNC	Connecting adapter for antennas- QMA to TNC

Ordering information

The Cisco 510 WPAN Industrial Router is available to any Cisco authorized partner. For more information, please contact your Cisco representative.

Cisco and Partner Services

Services from Cisco and certified partners can help you transform your network and innovate faster across the grid and enterprise. We have the deep, broad expertise to create a clear, replicable, and optimized field network across technologies.

Planning and design services help you use technology to achieve business goals and can increase deployment accuracy, speed, and efficiency. Technical services help improve operational efficiency, save money, and reduce risk. Optimization services continuously boost performance and help your team succeed with new technologies.

visit https://www.cisco.com/go/services to learn more.

Cisco Capital

Financing to Help You Achieve Your Objectives

Cisco Capital can help you acquire the technology you need to achieve your objectives and stay competitive. We can help you reduce CapEx. Accelerate your growth. Optimize your investment dollars and ROI. Cisco Capital financing gives you flexibility in acquiring hardware, software, services, and complementary third-party equipment. And there's just one predictable payment. Cisco Capital is available in more than 100 countries. Learn more.

For more information

- To find out more about the Cisco 500 WPAN Industrial Router family, visit https://www.cisco.com/go/ir500.
- For more information on the Cisco CGR 1000, visit https://www.cisco.com/go/cgr1000.
- For more information on the Cisco IoT Field Network Director, visit
  https://www.cisco.com/en/US/products/ps12360/index.html.
- For more information on the Cisco ASR 1000, visit https://www.cisco.com/go/asr1000.
- For more information on the Cisco Field Area Network solution, visit https://www.cisco.com/go/fan.