

Cisco IoT Field Network Director

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The Cisco IoT Field Network Director (FND) is the network management system for managing multiservice Field Area Networks (FANs), which include Cisco industrial routers, connected grid routers, gateways, and endpoints.

Features that distinguish the IoT FND are as follows:

- Ease of deployment at scale with Zero-Touch Deployment (ZTD) of IoT gateways and endpoints
- Secure and scalable end-to-end enrollment and management of gateways, endpoints, and Cisco IOx applications
- Optimization to operate on a FAN with constrained bandwidth
- Enterprise visibility into the health of gateways and endpoints
- Rich set of northbound APIs for third-party application integration

IoT FND is essential to the success of Internet of Things (IoT) solution deployments: Advanced Metering Infrastructure (AMI), Distribution Automation (DA), Demand Response (DR), outdoor lighting, transportation, asset tracking, and LoRaWAN infrastructures. It is a proven system on which many of our customers rely every day to deliver critical infrastructure services to millions of their customers.

Cisco IoT Field Network Director is built on a layered system architecture to enable clear separation between network management functionality and applications in fleet management, asset tracking, and utility, such as a Distribution Management System (DMS), Outage Management System (OMS), and Meter Data Management (MDM). This clear separation between network management and applications helps customers deploy IoT projects incrementally, for example, by extending AMI into a utility's DA using a shared multiservice network infrastructure and a common network management system across various utility operations. Further, a northbound API from the IoT Field Network Director allows various applications to pull and subscribe to appropriate, service-specific network communications data from a shared, multiservice communication network infrastructure. (See Figures 1 and 2.)

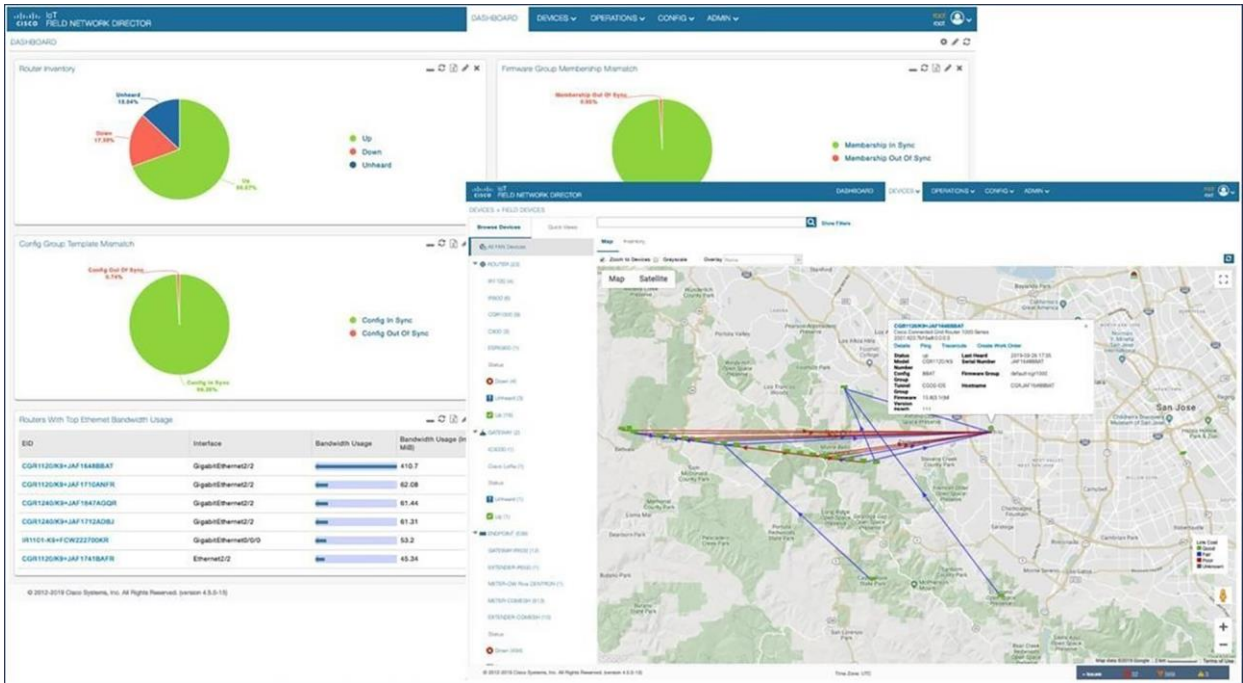


Figure 1.
IoT Field Network Director operator view

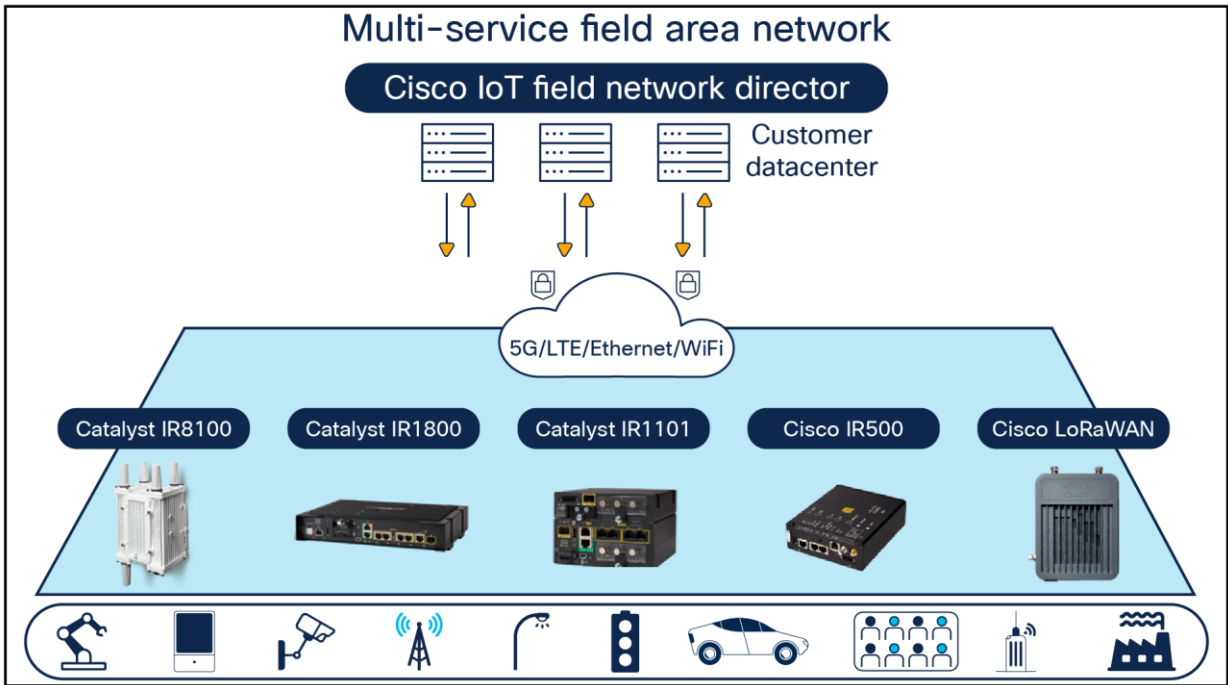


Figure 2.
Multiservice field area network and IoT FND in the head end

Core functionalities and supported devices

Table 1 describes IoT FND functionality, and Tables 2 through 4 list supported devices.

Table 1. Functionality

Function	Description
End-to-end security management	<ul style="list-style-type: none"> Fully automated, highly secure ZTD for gateways and endpoints Provisions mobile field technicians with time-bound security credentials to perform authorized field maintenance Integrates with enterprise security policies and role-based access control for network devices Provides device-level authentication through Authentication, Authorization, and Accounting (AAA) and RADIUS integration and alerts operators of attempted rogue device access to communication networks Integrates with standard Security Information and Event Management (SIEM) to help enable security and reporting needs (NERC-CIP compliance)
Fault management	<ul style="list-style-type: none"> Fault event collection, filtering, and correlation for communication network monitoring Supports a variety of fault event mechanisms for threshold-based rule processing, custom alarm generation, and alarm event processing Faults can be visualized on a color-coded GIS map view for the various gateways and endpoints Allows operator-level custom fault event generation, processing, and forwarding to various applications, such as an outage management system Automatic issue tracking based on events collected
Configuration management	<ul style="list-style-type: none"> Performs over-the-air software and firmware upgrades to remote endpoints Allows centralized configuration management, including change control enforced through operator role-based access control Delivers flexible device grouping options, including policy-based management and methods for deploying configuration changes
Accounting management	<ul style="list-style-type: none"> Logs access information for user activity for audit, regulatory compliance, and SIEM integration Simplifies management and enhances compliance by integrating monitoring, reporting, and troubleshooting capabilities
Performance management	<ul style="list-style-type: none"> Displays color-coded, real-time performance information on a GIS-based map Monitors and collects network device status and statistics Collects a standard set of metrics related to the operations network Provides a powerful threshold-based rule processing engine for exception reporting and visualization on a GIS map in real time Enables customized metrics collection frequency, along with historical trend reporting to suit operational needs
GIS map visualization, diagnostics, and troubleshooting tools	<ul style="list-style-type: none"> Allows entire network and security management function visualization on a GIS map view for operator ease of use Provides a color-coded state view, enabling a network operator to easily pinpoint network regions and devices to troubleshoot Provides real-time troubleshooting using ping and traceroute with visual output on a GIS map, with primary metrics for each link, node, and endpoint Provides geo tracking for mobile gateways based on GPS coordinates
Northbound API	<ul style="list-style-type: none"> Allows ease of integration for existing applications, such as OMS, MDM, trouble-ticketing systems, and manager of managers

Table 2. Supported gateways and endpoints

Product name	Product ID	
Cisco 1000 Series Connected Grid Routers	CGR1120/K9	CGR1240/K9
Cisco 500 Series Wireless Personal Area Network (WPAN) Industrial Routers	IR509UWP-915/K9	IR510-OFDM-FCC/K9
	IR529WP-915S/K9	IR510-OFDM-ANZ/K9
	IR529UWP-915D/K9	IR510-OFDM-BRZ/K9
	IR529UBWP-915S/K9	IR530D-OFDM-FCC/K9
	IR529UBWP-915D/K9	IR530S-OFDM-FCC/K9
Cisco Catalyst IR1100 Rugged Series Industrial Router	IR1101-K9	
Cisco 800 Series Industrial Integrated Services Routers	IR809G-LTE-GA-K9	Dual LTE
	IR809G-LTE-LA-K9	IR829M-2LTE-EA-AK9
	IR809G-LTE-NA-K9	IR829M-2LTE-EA-BK9
	IR809G-LTE-VZ-K9	IR829M-2LTE-EA-EK9
		IR829B-2LTE-EA-AK9
	IR807G-LTE-GA-K9	IR829B-2LTE-EA-BK9
	IR807G-LTE-NA-K9	IR829B-2LTE-EA-EK9
	IR807G-LTE-VZ-K9	IR829-2LTE-EA-AK9
		IR829-2LTE-EA-BK9
		IR829-2LTE-EA-EK9
		Single LTE
		IR829M-LTE-EA-AK9
		IR829M-LTE-EA-BK9
		IR829M-LTE-EA-EK9
		IR829M-LTE-LA-ZK9
	IR829B-LTE-EA-AK9	
	IR829B-LTE-EA-BK9	
	IR829B-LTE-EA-EK9	
	IR829GW-LTE-NA-AK9	
	IR829GW-LTE-VZ-AK9	
	IR829GW-LTE-GA-EK9	
	IR829GW-LTE-GA-ZK9	

Product name	Product ID	
		IR829GW-LTE-GA-CK9 IR829GW-LTE-GA-SK9 IR829GW-LTE-LA-*K9
Cisco 819 Integrated Services Routers	Hardened C819HG-U-K9 C819HG-S-K9 C819HG-V-K9 C819HG-B-K9 C819HG+7-K9 C819HGW+7-E-K9 C819HGW+7-N-K9 C819HGW+7-A-A-K9 C819HGW-V-A-K9 C819HGW-S-A-K9 C819HWD-E-K9 C819HWD-A-K9 C819H-K9 C819HG-4G-V-K9 C819HG-4G-A-K9 C819HG-4G-G-K9	Nonhardened C819G-U-K9 C819G-S-K9 C819G-V-K9 C819G-B-K9 C819G+7-K9 C819G-4G-V-K9 C819G-4G-A-K9 C819G-4G-G-K9
Cisco 5900 Series Embedded Services Routers	ESR 5921	
Cisco IC3000 Industrial Compute Gateway	IC3000-2C2F-K9	
Cisco Wireless Gateway for LoRaWAN	IXM-LPWA-800-16-K9	IXM-LPWA-900-16-K9
Cisco Connected Grid Endpoint	CGE	
Cisco Catalyst IR8100 Series Industrial Router	IR8140H-K9	IR8140H-P-K9 (PoE enabled)
Cisco Catalyst IR1800 Rugged Series Industrial Router	IR1821-K9 IR1831-K9	IR1833-K9 IR1835-K9

Table 3. Supported head end routers

Product name	Product ID	
Cisco Integrated Services Routers	ISR3900	ISR4431 ISR4321
Cisco Aggregation Services Routers	ASR1002-X ASR1002	
Cisco Cloud Services Router	CSR1000V	
Cisco Catalyst 8500 Series Edge Platform	C8500L-8S4X	C8000V

Note: IoT Field Network Director does not manage head end routers. It only monitors them for reachability and tunnel status.

Table 4. Supported third-party gateways and endpoints

Vendor	Product
Cohda Wireless	MK5 OBU MK5 RSU
Itron	OpenWay Riva ACT OpenWay Riva ACT Gateway OpenWay Riva ACT Extender OpenWay Riva BACT OpenWay Riva BACT Controller OpenWay Riva CAM1
Landis+Gyr	N2450 Gateway Revelo Endpoints M125, M225 Endpoints R661 Extender

Cisco IoT Field Network Director License Product IDs

To deploy FND, a perpetual application license needs to be purchased along with a set of device licenses (perpetual or subscription).

Table 5 lists subscription product IDs, and Table 6 lists perpetual product IDs

Table 5. Subscription product IDs

Subscription PID	Description
IOTFND-SOFTWARE-K9	Top-level PID for subscription licenses for devices
IOTFND-EP-1K	IoT FND subscription license for managing 1000 endpoints
IOTFND-BEP-1K	IoT FND subscription license for managing 1000 battery endpoints
IOTFND-CGR1000	IoT FND subscription license for managing CGR1000 router
IOTFND-IR509	IoT FND subscription license for managing IR500 endpoints
IOTFND-IR1100	IoT FND subscription license for managing IR1101 router
IOTFND-IR800	IoT FND subscription license for managing IR800 router
IOTFND-IC3000	IoT FND subscription license for managing IC3000 gateway
IOTFND-C800	IoT FND subscription license for managing C800 router
IOTFND-LORAWAN	IoT FND subscription license for managing LoRAWAN gateway
IOTFND-EP-100	IoT FND subscription license for managing 100 endpoints
IOTFND-CEP-1K	IoT FND subscription license for managing 1000 cellular endpoints
IOTFND-IR8100	IoT FND Subscription License for Managing IR8100 router
IOTFND-IR1800	IoT FND Subscription License for Managing IR1800 router
IOTFND-N2450	IoT FND Subscription License for Managing L+G N2450 router

Note: Maintenance price and IOx license are included in the pricing with subscription PIDs.

Table 6. Perpetual product IDs

Perpetual PID	Description
IOT-FND	Top-level PID for perpetual FND application license
R-IOTFND-K9	IoT FND RPM distribution for bare metal deployment without the database
R-IOTFND-V-K9	IoT FND OVA virtual machine with Oracle DB & embedded license (recommended for RF mesh; also compatible with gateways)
R-IOTFND-VPI-K9	IoT FND OVA virtual machine with Postgres DB (recommended for gateway management)
L-IOTFND-GIS-3YRS	License for GIS map
L-IOTFND-OPTIONKIT	Top-level PID for perpetual device licenses
L-IOTFND-EP-1K	IoT FND device license for managing 1000 endpoints including IR530
L-IOTFND-BEP-1K	IoT FND device license for managing 1000 battery endpoints (gas/water)
L-IOTFND-CGR1K	IoT FND device license for managing CGR1000 router
L-IOTFND-IR509	IoT FND device license for managing IR500 endpoints
L-IOTFND-IR800	IoT FND device license for managing IR800 router
L-IOTFND-C800	IoT FND device license for managing C800 router
L-IOTFND-LORAWAN	IoT FND device license for managing LoRaWAN gateway

Note: Maintenance will need to be purchased separately with perpetual PIDs.

Recommended hardware configuration

Tables 7 and 8 list recommended generic server hardware configurations for running Cisco IoT Field Network Director software and Oracle in bare metal deployment to manage up to 8 million endpoints in an AMI use case. Table 9 & 10 recommend these configurations for gateway deployments only. **Please refer to the system requirements and resource management guidelines of the latest / relevant IOT-FND release notes [here](#) for up-to-date information.**

Table 7. Application server hardware requirements for routers and endpoints

Nodes (Routers/Endpoints)	CPU (Virtual Cores)	Memory (RAM GB)	Disk Space (GB)
25/10,000	2	16	100
50/50,000	4	16	200
500/500,000	4	16	250
1,000/1,000,000	8	16	250

Nodes (Routers/Endpoints)	CPU (Virtual Cores)	Memory (RAM GB)	Disk Space (GB)
2,000/2,000,000 ¹	8	16	500
5,000/5,000,000 ¹	8	16	500
6,000/6,000,000 ¹	8	16	500
8,000/8,000,000 ¹	8	32	500

¹ .Clustered installation

Table 8. Recommended Oracle DB server hardware configurations

Nodes (Routers/Endpoints)	CPU (Virtual Cores)	Memory (RAM GB)	Disk Space (GB)
25/10,000	2	16	100
50/50,000	4	16	200
500/500,000	8	32	500
1,000/1,000,000	12	48	1000
2,000/2,000,000	16	64	1000
6,000/6,000,000	20	96	1000
8,000/8,000,000	32	160	2000

Tables 9 lists recommended minimum server hardware requirements for deploying a small OVA distribution of up to 25 routers.

Table 9. Recommended minimum server hardware requirements up to 25 routers with 4 and 6 cores

Nodes (CGR1K / IR1101 / Other Field Area Supported Routers)	CPU (Virtual Cores)	Memory (RAM GB)	Disk Space (GB)
-	4	32	250

Tables 10 lists recommended server hardware for gateway management of up to 15,000 industrial routers. Please refer the release notes for latest information.

Table 10. Recommended server hardware configuration up to 15,000 industrial routers with 4 and 6 cores

Nodes (CGR1K / IR1101 / Other Field Area Supported Routers)	CPU (Virtual Cores)	Memory (RAM GB)	Disk Space (GB)
15,000	6	32	500

Recommended software packages

Table 11 lists the recommended FND software packages for different use cases. For Cisco resilient mesh deployment in AMI, DA, DR, and outdoor lighting, use the package with Oracle Enterprise DB. For gateway management up to 15,000 gateways in a combination of industrial routers, industrial compute gateways, and LoRaWAN gateways, the Postgres OVA offers a simple way of getting the management system up and running.

Table 11. Recommended FND software package options for different use cases

Use case	Recommended software package
AMI and Demand Response (DR) with up to 8 million meters	IoT FND RPM distribution for bare metal deployment (R-IOTFND-K9) plus Oracle Enterprise ¹
Distribution Automation (DA) up to 15,000 routers OR	IoT FND RPM distribution for bare metal deployment (R-IOTFND-K9) plus Oracle Enterprise ¹
Gateway/router management in transportation, utility, smart city (LoRa), and oil and gas with maximum of 15,000 gateways / routers	IoT FND OVA virtual machine distribution for gateway management (R-IOTFND-VPI-K9)

¹ Customer will need to purchase the DB, separate servers & RHEL subscriptions to run FND.

² Oracle is included in the OVA. No additional license from Oracle is required. RHEL subscription is required and not provided.

High availability

IoT FND is a critical application for monitoring and managing a connected grid. IoT FND High Availability (IoT FND HA) solutions address the overall availability of IoT FND during software, network, or hardware failures.

IoT FND provides two main levels of HA:

- IoT FND Server HA
- IoT FND Database HA

For high system throughput, high availability, server load balancing, and redundancy, we recommend having at least two servers running the Cisco IoT Field Network Director software application and two servers running the primary and secondary databases in replication mode. High availability is only supported through Oracle in bare metal deployment model referenced in Tables 7 and 8 above. Please see FND installation guides for more information on supported High Availability deployments.

Cisco Environmental Sustainability

Information about Cisco’s environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the “Environment Sustainability” section of Cisco’s 2018 [Corporate Social Responsibility \(CSR\) Report](#).

Reference links to **information about key environmental sustainability topics** (mentioned in the “Environment Sustainability” section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product-material-content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries, and packaging	WEEE Compliance

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For more information

For more information about the Cisco IoT Field Network Director, visit <https://www.cisco.com/go/fnd>.

For more information about the Cisco Field Area Network solution, visit <https://www.cisco.com/go/fan>.

For more information about the Cisco 1000 Series Connected Grid Routers, visit <https://www.cisco.com/go/cgr1000>.

For more information about the Cisco 500 Series WPAN Industrial Routers, visit <https://www.cisco.com/go/ir500>.

For more information about the Cisco 1101 Industrial Integrated Services Router, visit <https://www.cisco.com/go/ir1101>.

For more information about the Cisco 1800 Industrial Integrated Services Router, visit <https://www.cisco.com/go/ir1800>.

For more information about the Cisco 8100 Heavy Duty Series Router, visit <https://www.cisco.com/go/ir8100>.

For more information about the Cisco 829 Industrial Integrated Services Routers, visit <https://www.cisco.com/go/ir829>.

For more information about the Cisco 809 Industrial Integrated Services Routers, visit <https://www.cisco.com/go/ir809>.

For more information about the Cisco IC3000 Industrial Compute Gateways, visit <https://www.cisco.com/go/ic3000>.

For more information about the Cisco LoRaWAN solution and product, visit <https://www.cisco.com/go/lorawan>.

For more information about the Cisco 819 Integrated Services Routers, visit <https://www.cisco.com/go/m2m>.

Document history

New or revised topic	Described in	Date
Revised message	Introduction	November 25 th , 2019
Added new devices supported and new product IDs	Tables 2, 3, 4, 5 and 6	November 3 rd , 2022
Updated recommended hardware configuration	Table 7 , Table 8	November 3 rd , 2022
Added recommended hardware configuration for OVA deployments	Table 9 , Table 10	November 3 rd , 2022
Updated recommended software packages	Table 11	November 3 rd , 2022
Added new devices supported and new product IDs	Tables 2 , 4 , and Table 5	June 28 th , 2023

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