

ANEXO VI

ESPECIFICAÇÕES TÉCNICAS DOS EQUIPAMENTOS IoT

MÓDULO/GATEWAY IoT

Os módulos/gateways IoT e sensores a fornecer deverão estar de acordo com as seguintes características mínimas obrigatórias:

- Equipamentos LoraWan Classe A, B e C;
- Índice de proteção IP67;
- Fatores de difusão;
- Adaptive Data Rates (ADR);
- Diversidade de canais;
- Sincronização de tempo GPS integrada;
- Geolocalização com suporte de hardware para trilateração baseada em TDOA e RSSI.

NOTA: Deverá estar incluída a antena RF;

As funcionalidades e um descritivo mais pormenorizado pode ser obtido a seguir:

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
Product components	• Standalone unit	• Attached to IR809 LAN Port	• Attached to IR829 LAN Port
Ethernet backhaul	• 1x FE built in the Gateway	• 1x GE on IR809	• 1x SFP module for copper and fiber on IR829
4G/LTE backhaul	–	• Single radio, dual SIMs on IR809	• Single or dual radios, dual SIMs on IR829
Wi-Fi backhaul	–	–	• 2.4 GHz/5 GHz 802.11n
PoE+ Injector for the Gateway	• External	• External	• PoE+ module option in IR829 to supply power to one Gateway
Cisco I/Ox support	–	• Yes, on IR809	• Yes, on IR829
IP features	<ul style="list-style-type: none"> • DHCP client (IPv4) • Static IP (IPv4) • PPPoE • 802.1Q VLAN tagging • Network Address Translation (NAT) • Domain Name System (DNS) • Network Time Protocol (NTP) 	<ul style="list-style-type: none"> • Routing Information Protocol Versions 1 and 2 (RIPv1 and RIPv2) • Generic Routing Encapsulation (GRE) and Multipoint GRE (MGRE) • Cisco Express Forwarding • Standard 802.1d Spanning Tree Protocol • Layer 2 Tunneling Protocol (L2TP) • Layer 2 Tunneling Protocol Version 3 (L2TPv3) • NAT • DHCP server, relay, and client (IPv4 and IPv6) • Static IP (IPv4 and IPv6) • Dynamic DNS (DDNS) • NTP • DNS Proxy • DNS Spoofing • Access Control Lists (ACLs) • IPv4 and IPv6 Unicast and Multicast • Open Shortest Path First (OSPF) • Border Gateway Protocol (BGP) • Enhanced Interior Gateway Routing Protocol (EIGRP) • Virtual Route Forwarding (VRF) Lite • Next-Hop Resolution Protocol (NHRP) 	

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
Security features	<ul style="list-style-type: none"> • IPsec (open source) • Two IPsec tunnels - support Active/Active or Active/Standby mode • Public Key Infrastructure (PKI) • Simple Certificate Enrollment Protocol (SCEP, open source) • Network Address Translation (NAT) traversal • Software image secure boot • Cisco ACT2 hardware IEEE 802.1ar secure identity • Support SHA256 for firmware signature and uboot • Authentication of the firmware image before flashing it • Password protection in file system 	<p>Secure Connectivity:</p> <ul style="list-style-type: none"> • Secure Sockets Layer (SSL) VPN for secure remote access • Hardware-accelerated Data Encryption Standard (DES), 3DES, Advanced Encryption Standard (AES) 128, AES 192, and AES 256 • PKI support • Twenty IPsec tunnels • Cisco Easy VPN Solution client and server • Network Address Translation (NAT) transparency • Dynamic Multipoint VPN (DMVPN) • Tunnel-less Group Encrypted Transport VPN • FlexVPN • IPsec stateful failover • VRF-aware IPsec • IPsec over IPv6 <p>Cisco IOS Firewall:</p> <ul style="list-style-type: none"> • Zone-based policy firewall • VRF-aware stateful inspection routing firewall • Stateful inspection transparent firewall • Advanced application inspection and control • Secure HTTP (HTTPS), FTP, and Telnet Authentication Proxy • Dynamic and static port security • Firewall stateful failover • VRF-aware firewall <p>Integrated threat control:</p> <ul style="list-style-type: none"> • Control-plane policing • Flexible packet matching • Network foundation protection <p>Others:</p> <ul style="list-style-type: none"> • Software image secured boot • Cisco ACT2 hardware IEEE 802.1ar secure identity • LAN port authentication to access DM Gateway • IPsec encryption between IR809 or IR829 and DM Gateway 	
Quality-of-Service (QoS) features	-	<ul style="list-style-type: none"> • Low-Latency Queuing (LLQ) • Weighted Fair Queuing (WFQ) • Class-Based WFQ (CBWFQ) • Class-Based Traffic Shaping (CBTS) • Class-Based Traffic Policing (CBTP) • Policy-Based Routing (PBR) • Class-Based QoS MIB • Class of Service (CoS) to Differentiated Services Code Point (DSCP) mapping • Class-Based Weighted Random Early Detection (CBWRED) • Resource Reservation Protocol (RSVP) • Real-Time Transport Protocol (RTP) header compression (cRTP) 	

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
		<ul style="list-style-type: none"> Differentiated Services (DiffServ) QoS preclassify and prefragmentation Hierarchical QoS (HQoS) 	
ISM band support	<ul style="list-style-type: none"> EU 863 - 870 MHz, India 865 - 867 MHz, U.S. 902 - 928 MHz, Australia 915 - 928 MHz, and AS 923 MHz, 902.2-923.4MHz Thailand Support for up to 16 uplink channels, 4 MHz bandwidth 		
LoRa technology	<ul style="list-style-type: none"> Semtech version 2 gateway hardware reference design compliance Adaptive Data Rates (ADR) Spreading Factors Channel diversity (no diversity and full diversity) 		
LoRaWAN specification	<ul style="list-style-type: none"> LoRaWAN specification 1.0.1, 1.0.2 and 1.1 (draft) release compliant Support for Class A, B and C endpoints 		
Radio spectrum sniffer	<ul style="list-style-type: none"> Online scanning of the interference noise on the RF channel 		
LTE coexistence	<ul style="list-style-type: none"> Interference reduction to LTE band 20 uplinks (832 - 862 MHz) 		
Geolocation capability	<ul style="list-style-type: none"> Through TDOA and RSSI for GPS-free endpoints 		
Linux Container (LXC)	<ul style="list-style-type: none"> Host third-party LoRa Packet Forwarder through software virtualization Support unprivileged mode 		
IoT FND management features	<ul style="list-style-type: none"> Zero-touch provisioning: automatically download configuration file to the Gateway, IR809 and 829 during registration Automatically download third-party LoRa Packet Forwarder to the Gateway during its initial registration IPSec tunnel setup automation Configure the settings of Gateway, the IR809 and IR829 Firmware upgrade Configuration file backup and restore Gateway reboot Gateway model Gateway ID (name and serial number) Gateway operational status Gateway up time Gateway enclosure cover close/open WAN IP address IPsec tunnel status Firmware version Boot loader version CPU usage rate Device temperature Alarm and event reports GPS status FPGA version HAL driver version 		
Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
	<ul style="list-style-type: none"> Antenna RSSI value AES key Packet Forwarder ID, status, firmware version, and public key installed 		

Compute and Storage	
CPU	• 1.33 GHz, single core
Memory	• 1 GB DDR4 RAM
Flash memory	• 4 GB
Interfaces and Controls	
Ethernet	• 1x 10/100 Mbps Fast Ethernet (RJ-45) • Support for PoE+ (802.3at) PD
RF antenna connectors	• Two extendable RF antennas, N-type
GPS antenna connector	• One extendable GPS antenna, TNC
Console	• 1x RJ-45
USB	• 1x USB 2.0, type A connector
Reset button	• Push to reboot system or for factory default recovery
Power	
Power input options	• PoE+, 802.3at • DC-In, 48 VDC, 0.7 A
Power consumption	• 30 Watts maximum
Ground	• 1x ground connector
GPS	
Built-In GPS	• High-sensitivity GNSS module • GPS L1C/A, QZSS L1C/A, SBAS L1C/A, GLONASS L1OF, and Galileo E1B/C ready • Time pulse accuracy <20 ns (clear sky) • NMEA 0183, Version 4.0
Specification	Applicable Regions
ANT-LPWA-DB-O-N-5	<ul style="list-style-type: none"> • Type: Omnidirectional • Operating frequency range: 863 - 928 MHz • Gain: 5 dBi • Environmental: Outdoor, IP67 rated • Operating temperature range: -40 to 156°F (-40 to 70°C) • Mounting: Wall and pole • Impedance: 50 Ohms • VSWR: 1.5 • Half power beam width: H:360°, V:30° • Polarization: Vertical • Weight: 790 g (not including the mounting kit) • Height: 892 mm • Diameter: 33 mm (mounted part) and 25 mm (body part) • Lighting protection: DC grounded • Connector: Type N Female • Wind resistance sustained: Up to 100 mph • Wind resistance gusts: Up to 185 mph

ACESSÓRIOS DO MÓDULO/GATEWAY IoT

- Kit de montagem em mastro/poste;
- Antena exterior omnidirecional, 863-928 MHz, com ganho de 5 dBi;
- IP67, 4dBi zenith, cabo 5m, ganho 25db LNA, TNC(m);
- Cabo 3m com conectores W/N;
- Licença para 16 canais gateway TPE.

SENSOR WIRELESS DE VIBRAÇÃO PARA MOTORES

- Com tecnologia LoRaWan, compatível com concentrador do módulo IoT;
- Gama mínima de temperatura de -20 a 85°C;
- Gama mínima de aceleração de 0 a 20mm/s;
- Sensor do tipo Yokogawa XS770A, ou equivalente, com sondas de temperatura, acessórios e bateria incluída com tempo de vida mínima de 10 anos;
- Comunicações *Near Field Communication* para configuração do sensor;
- Outras características:

Measurement data	Velocity (RMS), acceleration (peak), and surface temperature
	Axes: X, Y, Z axes and 3-axis composite Frequency range: 10 Hz to 1 kHz
Measurement range	Velocity: 0 to 20 mm/s Acceleration: 0 to 130 m/s ² Surface temperature: -20 to 85°C (-4 to 185°F)
Update time	1 minute to 3 days
Battery life	4 years (update time: 1 hour ^{*1}), battery replaceable
Dimensions and weight	97 × 46 × 46 mm, 260 g
Explosionproof	ATEX, IECEx, FM

*1 Ambient temperature: 23 ± 2°C (73.4 ± 3.6°F)

SENSOR WIRELESS DE TEMPERATURA PARA MOTORES

- Com tecnologia LoRaWan, compatível com concentrador do módulo IoT;
- Gama mínima de temperatura de -200 a 2315°C;
- Possibilidade de integração de dois termopares;
- Sensor do tipo Yokogawa XSI10A + XS550, ou equivalente, com acessórios e bateria incluída com tempo de vida mínima de 10 anos;
- Comunicações *Near Field Communication* para configuração do sensor;
- Outras características:

Measurement data	Temperature, 2 points (non-insulated)
Measurement range	Thermocouples of types B, E, J, K, N, R, S, T, C -200 to 2315°C (-328 to 4199°F) ^{*1}
Reference contact compensation accuracy	±1.0°C
Accuracy	Refer to the General Specifications for the XS550 Temperature Measurement Module.
Update time	1 minute to 3 days
Battery life	10 years (update time: 1 hour ^{*2}), battery replaceable
Dimensions and weight ^{*3}	141 × ø68 mm, 800 g or less
Explosionproof	ATEX, IECEx

*1 Depends on the type of thermocouple used. *2 Ambient temperature: 23 ± 2°C (73.4 ± 3.6°F) *3 Dimensions and weight depend on the specifications selected.

SENSOR DE INTRUSÃO

- Com tecnologia LoRaWan, compatível com concentrador/gateway do módulo IoT;
- Sensor de intrusão do tipo Elsys EMS Door, com bateria incluída com tempo de vida de 10 anos;
- Comunicações *Near Field Communication* para configuração do sensor.

SENSOR DE MOVIMENTO

- Com tecnologia LoRaWan, compatível com concentrador/gateway do módulo IoT;
- Sensor do tipo Netvox RBI IE ou equivalente;
- Detecção de movimento em distâncias entre os 2 e 12 metros;
- Gama de medição de temperatura: -20°C ~ 55°C;
- Gama de medição da iluminação: 0-1100 LUX
- Protocolo de segurança: Encrypt-RF™ Security.

SENSOR DE TEMPERATURA E AMBIENTE

- Com tecnologia LoRaWan, compatível com concentrador/gateway do módulo IoT;
- Gama mínima de temperatura de 0 a 40°C;
- Gama mínima de humidade de 0 a 85%;
- Sensor do tipo Enless-Wireless TX T&H 600-034, ou equivalente;
- Comunicações Near Field Communication (NFC) para configuração do sensor.

SENSOR ATUADOR PARA PORTÃO

- Com tecnologia LoRaWan, compatível com concentrador/gateway do módulo IoT;
- CPU Cortex M0+;
- RTC;
- EEPROM 32KB;
- Flash 64KB;
- Encriptação AES 128 bit;
- Class C LoRaWAN® EU868, AS923, AU915, US915;
- 1 entrada 230Vac;
- 1 saída relay com contactos COM, NO, NC;
- 8Amp@230Vac;
- Comunicações Near Field Communication (NFC) para configuração do sensor;
- Gama da temperatura de funcionamento: -10 + 70C°
- Certificado IP68.

SENSOR DE DETEÇÃO DE FUMO

- Com tecnologia LoRaWan, compatível com concentrador/gateway do módulo IoT;
- Sensor do tipo ZENNER Smoke Detector Easy Protect, com bateria incluída com tempo de vida de 10 anos;
- Interface radio LoRaWan;
- Alinhado com os standards DIN 14676 e N 14604:2005;
- Funcionalidade de poupança de energia quando em modo noturno, quer a nível de brilho de LEDs, quer a nível de alarmes não relevantes para a segurança.