Smart Outdoor LoRa Gateway of Cotx Networks

Product Introduction

COTX-X series outdoor LoRa smart gateway is a new generation product of low-power WAN-IoT converged gateway independently developed by Beijing Cotx Networks Technologies Co. Ltd. (COTX). It supports the LoRaWan standard formulated by the International LoRa Alliance, and is compatible with other LoRa modules or terminal products developed based on the standard LoRaWan protocol. It can be deployed in various application scenarios with multiple uplink interface options such as WiFi, Ethernet, and eMTC/NB-IOT. The built-in LoRa low-frequency chip can satisfy the coverage range of 1km-15km according to the actual conditions of deployment. The terminal can transmit data by the LoRa protocol for WAN-level transmission with lower power consumption.

Product Features

Wide coverage, meeting long-distance complex conditions such as cities and countryside

The COTX-X-O converged gateway uses LoRa low-power chips to extend the signal into the noise.

Even if the signal power density is 20dB lower than the noise, it can still recover the signal. The receiving sensitivity is up to -140dbm, which can meet the requirement of long-distance access services in various scenarios such as city and countryside.

COTX-X-O can reach 2-3KM coverage in a complex urban environment, which can satisfy the long-distance data backhaul of a series of urban infrastructures such as parking geomagnetic, manhole covers, trash cans and street lights. By uploading data to the cloud in real time, it can provide effective supports of data for the smart city's integrated business plan, and promote the effective implementation of new smart city plans.

At open sites such as agriculture, forestry and livestock industry, COTX-X-O can satisfy 10KM long-distance transmission. It collects farming environmental data from agricultural field, greenhouse and livestock industry, ensuring the effective backhaul of the data of crop production, and providing data support for scientific breeding. It tracks and searches the grazing livestock in the livestock farm to ensure the property safety of farmers and herders.

COTX-X-O can also be applied to communication conditions with long-distance, low-power consumption and IoT terminals in industries, parks, energy, electricity, etc.

High concurrency, thousands of terminals converged and accessed

The LoRa chips embedded in the COTX-X-O support up to 8 uplink channels with simultaneous encoding and decoding, 1 downlink channel and 1 FSK channel, which greatly increases user capacity. Within its coverage area, it can satisfy the access of thousands of IoT terminals according to the difference of terminal data's reporting frequency, and ensure stable communication link of the IoT terminals in the case of large connections.

High-level security protection

COTX-X-O series utilize low-power LoRa technology and adopt a frequency hopping mechanism for different terminals, that is, different communication channels are selected according to environmental

conditions, which is difficult to monitor. The spread spectrum transmission adopted by LoRa has inherent advantages of good concealment: since the spread spectrum signal is spread over a relatively wide frequency band, the power in the unit frequency band is very small, so the signal falls into the noise, which is generally not easy to be found, and it is more difficult to further detect signal parameters such as pseudo-random coding sequence.

COTX-X-O series outdoor LoRa gateway cooperates with the cloud key management system to support high-level security protection. The entire network adopts a unified KEY Management system to manage the life cycle of secret key. Through overall consideration and excellent professional design, the gateway has a consistent security protection mechanism, regardless of whether it is offline or online, and it also provides secure data transmission and secure encrypted storage capacity of local key data.

Comprehensive and diverse options for backhaul

COTX-X series gateways support multiple uplink access methods of eMTC/NB-IoT, providing users with flexible and diverse uplink options when deploying complex networks:

- When the uplink network is Ethernet, the Ethernet interface can be selected.
- The operator's cellular network can be accessed optionally through eMTC/NB-IoT uplink interface.
- WiFi infrastructure network can be optionally accessed.

Flexible and easy to deploy

COTX-X-O series outdoor LoRa gateways can be quickly deployed in operator's towers, logistical centralized zones of harbor, building roofs in community, scenic spots in parks or light poles of road. The power supply problem during installing the outdoor gateway can be solved by local power supply or using POE power supply mode compatible with 802.3at. If there is no local power source, it can be powered by solar energy.

Full APP manipulation, humanized operation and maintenance management

The first IoT security gateway in the industry that can be conveniently controlled by APP ensures professional design of security while it is conveniently controlled. COTX-X-O has a built-in GNSS/GPS/Beidou positioning module. The APP can sense the location of base stations and terminals in real time through positioning, taking a city map as background for maintenance, and intuitively show the LoRa signal coverage in complex urban environments to carry out base station expansion and signal compensation depending on the difference of coverage and access conditions, so as to ensure the effective backhaul of terminal data. At the same time, during the operation process, the location of faulty terminal can be accurately sensed through the APP map, which is measured down to the street and intersection, and the operators can perform targeted maintenance according to the map instructions.

COTX-X-O series LoRa gateways have built-in WiFi/BLE Bluetooth management module. For the local maintenance of the outdoor gateway, the user does not need additional investment of installers to mount poles and plug cables during the equipment maintenance process. Debugging and diagnosing the outdoor gateway in a high place can be completed by using the APP of mobile phone, which greatly reduces the difficulty of user's troubleshooting.

Multi-service interface and analysis capabilities, rich application scenarios

COTX-X series LoRa gateway has a variety of service interfaces, supporting access protocols of mainstream IoT such as LoRa, WiFi, and BLE, and allowing the third-party terminals complying with the standard LoRaWan protocol to access.

- Smart agriculture, forestry and livestock

  At sites of agriculture, forestry and livestock, effective backhaul farming environmental data of agricultural field, greenhouse and livestock industry and data of crop production provides supports of data for scientific breeding. It tracks and searches the grazing livestock in the livestock

farm to ensure the property safety of farmers and herders.

- Smart city

COTX-X is applied to coverage to urban complex environment, which can satisfy the long-distance data return of a series of urban infrastructures such as parking geomagnetic, manhole covers, trash cans and street lights. By uploading data to the cloud in real time, it can provide effective supports of data for the smart city's integrated business plan, and promote the effective implementation of new smart city plans.

Product function

COTX-X-O series

Product Features	Description
Ethernet	Auto-negotiation of 1*FE 10/100M rate
NBIoT	● Single Radio, single SIM card ● eMTC(LTE-CAT M1)/NBIoT uplink (one option from two)
WiFi	● 2.4 GHz 802.11b/g/n ● Wireless client mode ● Wireless hotspot mode
Capability of TDOA positioning	Support positioning no GPS terminal location via TDOA and terminal RSSI
Application installation	Support Linux system software/application installation extension
Smart power-saving	Support manual/automatic entry into smart power-saving mode
Support installation of LoRa Packet Forwarder for third-party	Support installation of Lora packet forwarder SDK on third-party platform
Local standard LoRaWan NS/AS	● Support local standard LoRaWan NS/AS, and offline cache data of gateway ● Synchronization for gateway resuming online data
Access to third-party terminal of LoRaWan	Support access to third-party terminal of standard LoRaWan
Compatible with mainstream IoT cloud platforms	Compatible with mainstream IoT cloud platforms in domestic and abroad
Scanning wireless channel	Support scanning wireless channel for environmental

	quality
Wireless listening	Support listening to wireless messages to diagnose and analyze message interaction of wireless network data
IP Features	
DHCP	● DHCP server(IPV4 and IPV6) ● DHCP client (IPV4 and IPV6)
Static IP	Static IP (IPV4 and IPV6)
DNS	DNS client
NTP	NTP client
Networking for communication	Starlike network/MESH ad hoc network communication
Security Features	
Integrated KEY Management System for online/offline application	● Integrated KEY generation management of cloud/gateway/terminal ● Gateway offline operation KEY management is consistent with the cloud
TID trusted identity service	Support TID trusted identity service, combined with TID cloud service to perform authenticating device for high security level
Security encryption algorithm	Data Encryption Standard (DES), 3DES, Advanced Encryption Standard (AES) 128, AES 192, and AES 256
PKI (Public Key Infrastructure)	Support PKI public key infrastructure of X.509 standard
Secure HTTP/MQTT	Support HTTPS/MQTT TLS secure channel connection to the cloud
VPN	Support PPTP protocol to remotely access local ISP network and services
Encrypted storage	Terminal key/ encrypted storage of data
Safe boot of system files	Isolate boot of system files from third-party application software
Digital signature verification of system files	System files support digital signature verification
LoRa features	
LoRaWan protocol	● LoRaWAN standard 1.0.1 and 1.0.2 ● Support Class A/B/C terminal
LoRa Technology	● Automatic rate adjustment of adaptive Data Rates (ADR) terminal ● Spread-spectrum factor

ISM band	● CN470-510MHz， EU863-870 MHz, U.S.902-928MHz， AU915-928MHz ● Maximum 8 channels
System control	
System management method	● Support SSH remote security access control ● Cotx Networks APP ● Cloud Platform of Cotx Networks
Indication of system status	● System LED indicator, ● Cotx Networks APP (system status display of CPU/Memory/Temperature/Version)
Abnormal alarm of system status	Alarm notification from Cotx Networks APP
System configuration management	● Save and backup system configuration, ● Restore system configuration to the initial setting
OS	● Upgrade system software ● Shutdown system ● Restart system
System log	Support log audit of system/terminal behavior

Product specifications

COTX-X series

Product specifications	COTX-X1-O	COTX-X3-O
Physical specifications		
Product size (H*W*D)	● H*W*D：235*190*70mm	
Product weight	● 2300g	
Material of accessories	● Aluminum alloy	
Fixing way	● Wall-mounted, desktop or outdoor placement	
Operating temperature	● -40℃ ~ 70℃	
Protection level	● IP67	
System performance		
OS	Linux OS 4.9	
CPU	Quad-core 1.2GHz	

RAM	1GB DDR2 RAM	
Lora performance		
Operating frequency	● China: 470MHz~510MHz, ● Europe and other regions: 863-870Mhz, ● America and other regions: 902-928Mhz, ● Australia: 915-928Mhz	
Number of channels	2 channels in uplink at the same time	8 channels in uplink at the same time
Data rate	292.97bps、537.11bps、976.56bps、1757.81bps、3125bps、5468.75bps (there are two kinds at the same time)	292.97bps、537.11bps、976.56bps、1757.81bps、3125bps、5468.75bps
Receiving sensitivity	-136dbm	-140dbm
Transmitting power	25dBm	27dBm
Device interface		
Ethernet	1* 10/100 fast Ethernet interface (RJ-45)	
WIFI	1* 802.11 b/g/n 2.4GHz	
Operator	eMTC（LTE-CAT M1） NB-IOT	
BLE	1* Bluetooth BLE4.1	
Micro SIM card slot	1* Micro SD card (32G capacity as standard configuration)	
RF1 antenna	1*External LORA antenna, N type interface	
RF2 antenna	1*External NB-IOT antenna, N type interface	
GPS antenna	1*External GPS antenna, N type interface	
WIFI antenna	1*External WIFI antenna, N type interface	
GNSS		
GNSS/GPS/Beidou module	● GPS L1C/A, QZSS L1C/A, SBAS L1C/A ● GLONASS L1OF ● Beidou positioning system	
Power		
Local power supply	● POE supports 802.3at with compatible power supply, ● DC12-48V input power supply	
Maximum power consumption	<15W	
LEDs		

System LED	OFF: the system is not powered on FLASH: the system is starting, ON: the system is operating normally

Ordering Information

COTX-X series outdoor IoT smart converged gateway

Product Type	Product description
COTX-X1-CN-O	● SME-level outdoor Lora IoT access gateway of COTX IoT in China ● Operating frequency: 470MHz-510Mhz, applicable standard LoRaWAN in China ● Supporting channel: 2
COTX-X3-CN-O	● Operator-level outdoor Lora IoT access gateway of COTX IoT in China ● Operating frequency: 470MHz-510Mhz, applicable standard LoRaWAN in China ● Supporting channel: 8
COTX-X1-EU-H-O	● SME-level outdoor Lora IoT access gateway of COTX IoT in Europe ● Operating frequency: 863MHz-870Mhz, applicable standard LoRaWAN in Europe, Middle East, Africa and India ● Supporting channel: 2
COTX-X3-EU-H-O	● Operator-level outdoor Lora IoT access gateway of COTX IoT in Europe ● Operating frequency: 863MHz-870Mhz, applicable standard LoRaWAN in Europe, Middle East, Africa and India ● Supporting channel: 8
COTX-X1-US-O	● SME-level outdoor Lora IoT access gateway of COTX IoT in America ● Operating frequency: 902MHz-928Mhz, applicable standard LoRaWAN in America, Asia Pacific and other regions ● Supporting channel: 2
COTX-X3-US-O	● Operator-level outdoor Lora IoT access gateway of COTX IoT in America ● Operating frequency: 902MHz-928Mhz, applicable standard LoRaWAN in America, Asia Pacific and other regions ● Supporting channel: 8
COTX-X1-AU-O	● SME-level outdoor Lora IoT access gateway of COTX IoT in Australia ● Operating frequency: 915MHz-928Mhz, applicable standard LoRaWAN in Australia ● Supporting channel: 2
COTX-X3-AU-O	● Operator-level outdoor Lora IoT access gateway of COTX IoT in

	Australia ● Operating frequency: 915MHz-928Mhz, applicable standard LoRaWAN in Australia ● Supporting channel: 8

Antenna

Product Type	Product description	Notes
ANT-LORA-CN-B1	Indoor and outdoor omnidirectional antenna, operating frequency band 470MHz-510Mhz, 3dbi, N interface, FRP	Standard
ANT-LORA-CN-B2	Indoor and outdoor omnidirectional antenna, operating frequency band 470MHz-510Mhz, 6dbi, N interface, FRP	Optional
ANT-NB-CN-B1	Indoor and outdoor omnidirectional antenna, operating frequency band 824~960MHz, 1710~2170MHz, 3dbi, N type interface	Standard

Fittings

Product name	Product description	Notes
Tweezer	Used to remove the SIM card or TF card in the device	Standard
Screwdriver	Used to install and dismantle the device	Standard
power supply line	power supply line with Micro USB interface	Standard
TF Card	Storage space of the device, 1*32G	Standard

Compatibility list

COTX-X series outdoor smart converged gateway of COTX is compatible with the following mainstream cloud platforms

Cloud platform	Compatibility
COTX IoT platform	YES
Actility	YES
TTN	YES
Jasper（Cisco）platform	YES
Azure IoT platform	YES
AWS IoT platform	YES
Alibaba IoT platform	YES
Tencent IoT platform	YES
Baidu Cloud IoT Platform	YES
China Unicom IoT Platform	YES
China Mobile IoT Platform (ONENET)	YES
China Telecom IoT Platform	YES

COTX-X series outdoor smart converged gateway of COTX is compatible with the following scenario-based terminals

Smart City		
COTX-L-LS102	Hydraulic pressure transmitter	A stable and highly reliable piezoresistive pressure sensor and a high-performance dedicated circuit for transmitter are used to detect fluid pressure in petroleum, chemical, electric power, hydrology, geology and other industries.
COTX-L-LS103	Liquid level transmitter	The wireless transmitting liquid level transmitter whose liquid level measured by fully-sealed submersible diffusion silicon is used, which is widely applied to monitor liquid level in the fields of property fire-fighting, industry, petroleum, power plants, mines, urban water supply and drainage, and hydrological exploration.
COTX-L-LS104	Water-immersion transmitter	Based on the principle of liquid conductivity, the sensor uses 4 probes to perform testing. Normally, the two-pole probe is insulated by air; when the probe is immersed in water, it will automatically alarm. It widely used in communication base stations, precision computer rooms, libraries, exhibition halls, museums and other application scenarios.

COTX-L-LS105	Buried geomagnetism	Three axis magnetoresistance sensor is used to dynamically track the changes of environmental magnetic field parameters, and then the status information of occupied / idle parking spaces can be accurately identified. It is widely used in urban road parking, scenic spot parking, community parking and so on.
COTX-L-LS108	Manhole cover alarm	The manhole cover status is monitored in real time, and the alarm information is automatically upload when the manhole cover moves or opens abnormally. It is widely applied to monitor manholes in safety in the fields of municipal administration, electric power, telecommunications, energy and so on.
COTX-L-LS109	Single lamp controller	It can monitor and collect the voltage, current, power, electric energy and other data parameters of a single street lamp, and has functions such as controlling switches of street lamp and dimming. It is widely used in tunnel lighting, urban road lighting, landscape lighting and other scenarios.
Smart environment and location monitoring		
COTX-L-LS107	Wireless humiture collection unit	A wireless humiture collection unit integrates data collection of temperature and humidity and monitoring. It is widely used in communication equipment rooms, workshop production lines, pharmaceutical warehouses, large logistics warehouses, agricultural greenhouses, flower greenhouses, archives, museums, HVAC control and other application scenarios that require monitoring temperature and humidity and alarming.
COTX-L-LS111	GPS positioner	Built-in GPS module, G-sensor sensor and anti-folding switch are used to monitor the positioning of items. It is widely applied to supervise asset, position livestock, supervise commodities, and position shared bicycle and so on.