Application of 4G IOT Card in Automatic Weather Station

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Abstract. The “Industry Application Card” (an SIM card of the 2G dedicated line network) for the automatic transmission of weather station data widely used by the meteorological department of Liaoning Province had been strictly investigated, and it was found that the “Industry Application Card” supports the access between the public network and the private network, and allows text messages to be sent to the “civil SIM card” of the public network through the private network, so it is the preferred SIM card for telecom fraudsters. The 4G IoT card solves these problems. Open the Ping Tester app after inserting the IoT SIM card into the tester mobile, then use it to ping the IP address of the server in Liaoning Meteorological Information Center. A successful connection would imply that the connection to the Liaoning Meteorological Information Center’s Intranet via IoT is functional, and that the IoT SIM card can be used to automatically transmit the meteorological station’s data. The automatic weather stations generally using the automatic weather station models of local meteorological bureaus in Liaoning Province can use “Huayun Shangtong local maintenance management software” for the parameters configuration of automatic weather stations. After the “Huayun Shangtong local maintenance management software” is connected to the port of the automatic weather station, by finding the matched automatic weather station type, entering the error diagnosis interface of the corresponding station type, clicking the “Start Monitoring” button to read the device status information.

1. Introduction

As the “2016 August 19 Xu Yuyu Telecom Fraud Case” had been attracting the public attention and triggered hot discussion, the Ministry of Industry and Information Technology issued the Notice on Conducting Pilot and Demonstration Work for Cybersecurity in the Telecommunications and Internet Industries in 2016, requiring to thoroughly investigate the chaotic phenomena in the telecommunications industry[1-2]. In the strict investigation on the “Industry Application Card” (2G dedicated line network SIM card) for automatic transmission of the weather station data widely used by the meteorological department of our province, it was found that this card supports the access between the public network and the private network, and it also allows text messages to be sent to the public “civil SIM card” through the private network, so it is the preferred SIM card type for telecom fraudsters[3]. Therefore, the industry application card business was planned to be stopped, and the already opened industry application cards were used under strict supervision. In addition, with the popularization of 4G networks, the data priority of application cards in the 2G dedicated network industry card, especially in areas with high staff density and concentrated network usage periods, such as university campuses, where network link outage occurred often for this card, significantly reducing the timeliness ratio and accuracy rate of the data of the weather station. With the emergence of 4G IoT card, these problems have been fundamentally resolved[4-5].
2. Features of 4G IoT Card APN Dedicated Line
The 4G IoT card APN line is different from the APN line of the previous 2G industry application card. They are two completely physically isolated communication lines, and the SIM cards used are also completely different. You cannot log in to the 4G IoT APN line with a 2G industry application card, and vice versa. The 4G IoT SIM card is different from the SIM card chip of the 2G industry application card. The two SIM cards cannot be used without difference. Both the 4G IoT and the 2G industry application card belong to dedicated line transmission, with different names of access points, and the “dedicated line + dedicated line” cannot be transmitted in parallel. The 4G IoT card belongs to dedicated line communication and is physically isolated from the civil public network to ensure use safety.

The 4G IoT card has excellent universality and compatibility. 4G IoT cards are 11-digit SIM cards, which can be used in various models of automatic weather station equipment; The 4G IoT APN dedicated line is a mode line compatible for 2G, 3G and 4G, mainly for 4G network, and downward compatible with 2G and 3G network, and it’s compatible for CAWS600RT and other automatic weather station models that can only apply the 2G network.

3. Upgrade process of 4G IoT card

3.1. SIM card test
Put the IoT SIM card directly into the test mobile phone, after it has logged in to the network successfully, use the APP program with the ping function such as Ping Tester to Ping 10.86.26.124 (the central station server of the automatic weather station), 172.19.1.6 (the Notes server), 172.19.1.30 (the database server) and other IP addresses of the Liaoning Meteorological Information Center, and the addresses all can be pinged, with excellent data communication and extremely low packet loss probability. It shows that access to the intranet of Liaoning Provincial Meteorological Bureau through the Internet of Things works well, and the IoT SIM card can be used as an automatic weather station data transmission service.

3.2. Access method for 4G Internet of Things
The update of the 4G IoT card must be completed at the site of the automatic weather station. In our province, meteorological bureaus mostly use automatic weather stations of the following models: CAWS3000JT, CAWS1300A, HY361(364), HY321(324), CAWS600RT, CAWS600RE, CAWS600B and so on. Automatic weather stations can use “Huayun Shangtong local maintenance Management software” for the simple and quick parameter configuration of automatic weather stations.

As shown in “Automatic Weather Station Parameter Configuration”, connect the serial port of the automatic weather station with a laptop computer at the site of the automatic weather station, first connect to the automatic weather station port with “Huayun Shangtong local maintenance management software”, and then find the automatic weather station type that has been matched, enter the parameter setting interface of the corresponding site type, and the main “center parameter” information will be configured, including: the IP address of the center server, the port number of the center server and the name of the GPRS access point. After inputting these three parameters, click the setting button in the “center parameter” block diagram, and you can see that the center parameters setting is successful in the “status description”. In order to ensure the accuracy of parameters set, you can click the “Acquire” button in the “Center Parameters” block diagram, and you can see in the “Status Description” that the acquisition of the center parameters has been done. At this time, check whether the “Center Parameters” information matches the required configuration information.

Other types of automatic weather stations that do not support the debugging of Huayun Shangtong local maintenance management software can be set using their original debugging tools, and the required configuration parameters are the same. For example, for sites that use model 7118 of Hongdian’s communication module, Hongdian DTU setting software, serial debugging assistant, super
terminal and so on can be employed for debugging; Huayun Shengda portable automatic weather station collector can adopt the OSSMO software for debugging.

3.3. Connection test

To ensure the smooth application of the new 4G IoT card, the operation monitoring function of Huayun Shangtong’s local maintenance management software can be useful. When using Huayun Shangtong local maintenance management software, it’s a must to connect to the automatic weather station port first, and then find the matched automatic weather station type, enter the error diagnosis interface of the corresponding station type, and click the “Start Monitoring” button to read the device status information.

As shown in “Automatic Weather Station Connection Monitoring”(Fig.1), after clicking the “Open Monitoring” function, in the current status information column of the device, you can see several key information as follows: “Open Module” “Initialization Operation” “Wireless Network Signal Value Greater Than 20” “successfully logging in to the wireless network” “successfully connecting to the central server” “successfully sending the test heartbeat to the central server” “successfully sending and receiving receipts from the central server”, which indicates that the automatic weather station has successfully connected to the central server. The 4G IoT card functions smoothly.

4. Conclusion and discussion

With the 4G IoT card included into the data transmission work of the meteorological department's automatic weather station, the following problems have been solved: a) The meteorological service dedicated network and the 4G IoT card APN dedicated line are inter-connected, realizing special encryption of meteorological data transmission and comprehensive enhancement of data security; b) The meteorological service dedicated network is completely isolated from the civil public network, improving the overall security of the meteorological service dedicated network; c) The timeliness of data transmission is improved, from one encrypted message in the past 10 minutes to one encrypted message in 5 minutes, and the timeliness has been doubled; d) The meteorological service dedicated network for 4G IoT card blocks spam messages and harassing phone interference from other network
SIM cards; e) The data priority of the G-IoT card has been dramatically improved, and it is no longer troubled by the delay of the 2G network; f) The realization rate of message transmission and the accuracy of message contents of meteorological automatic stations have been greatly improved; g) The bit error rate and bit error rate have been greatly reduced, thereby greatly reducing the work pressure of the central server; h) The timeliness of 4G IoT card messages of the special meteorological service network has been greatly improved. The “integral message” can be basically uploaded and stored before 02 minutes. The application of 4G IOT card in automatic weather stations improves the timeliness of weather warning information. Therefore, the 4G IoT card plays an important role in the service of automatic weather stations, and makes remarkable contributions to the improvement of weather services.

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