ST9633NC

Airborne MESH Networking Equipment

ST9633NC Airborne meshnetworking equipment， The equipment is compact in design and exquisitely designed, which can be installed either in front or in reverse, which is convenient for installation. It is especially suitable for scenarios with lightweight networking requirements such as drones, robots, and unmanned vehicles. The equipment quickly self-organizes and heals, and automatically multi-hop relay, which can provide voice group call, video backhaul, data relay and other multimedia interactive services for unmanned application systems to achieve efficient collaboration. Equipment working frequency：512~582MHz、570~590（U band）、1240~1300MHz、1428~1448MHz（L band），It has voice intercom function, GPS/Beidou positioning function, and also supports wifi coverage.

The advanced MESH design concept does not require a central gateway. Any one can realize the self-organizing network function. Any device in the group is offline, and the corresponding device will continue to communicate within the effective antenna coverage. The network does not drop. In practical applications, we can use ring network design without worrying about the problem of ring network blockage. At the same time, in addition to the mesh function on the wireless end, the product also has the mesh function on its own wired network port, which can be selected and used according to the actual application environment. As a wireless extension and extension of fixed radio stations or vehicle-mounted radio stations in multi-hop ad hoc networks, it is convenient to go deep into emergency scenes, dense crowds or buildings, and greatly enhance the network's in-depth communication capabilities. It can provide wireless broadband digital communications for emergency response, anti-terrorism, riot control, covert reconnaissance, special operations, rescue and disaster relief, and daily patrols. The transmission distance is 20-60 kilometers from air to ground, and the ground can be more than 10km in open environment, and 300~1000m in blocking environment (depending on blocking environment)

I. Main features of the system:

i. Non-center co-frequency networking

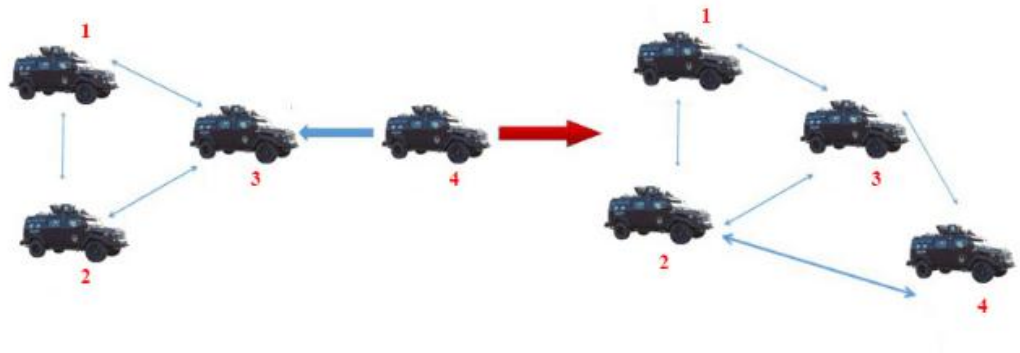
The MESH wireless ad hoc network system is a non-centered co-frequency system, with all nodes equal in status, a single frequency point supports two-way communication, simple frequency management, and high spectrum utilization. Any node device can be used as an end node, relay node or command node in the network. At any time, anywhere, without any other fixed communication network facilities (such as optical fiber, copper cable, etc.), a wireless communication network can be quickly established. All non-centered co-frequency self-organizing network equipment, including outdoor fixed stations, emergency deployment consoles, vehicle-mounted stations and vehicle-mounted portable stations, etc. Can automatically form a wireless mesh network and communicate with each other in real time just by turning on the power.

ii. Multi-node fast and flexible networking

The MESH wireless ad hoc network system currently supports 32 nodes in the same frequency network, which can be deployed quickly and flexibly. When each node is moving fast, the system can automatically recalculate the routing relationship between multiple nodes according to various indicators such as channel quality, data service rate, bit error rate, etc., as the topology changes information. A new routing table is quickly generated, and the network topology is updated in real time. At this time, voice, data and video services will not be affected by changes in the system topology.

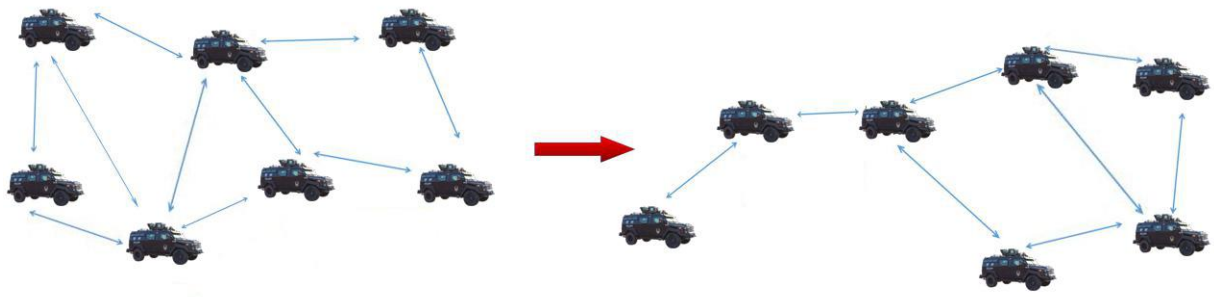
1. Quick access

After the node is powered on, the network can be registered in "seconds", which is simple and practical. Ensure that system nodes can quickly establish communication when they re-enter the network after being offline. As shown below, the car 4 is offline due to movement, and when it approaches the existing network, it can quickly re-enter the network.



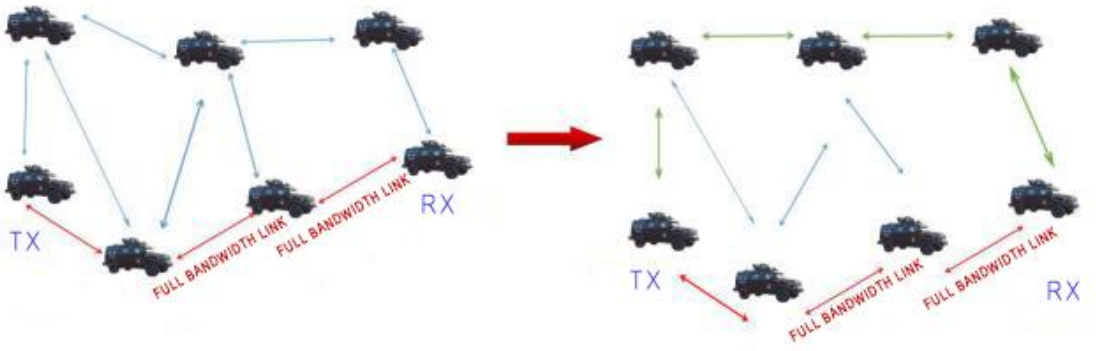
2. Fast routing update

As shown on the left side of the figure below, 7 vehicles form a maximum of 3 hops topology. When the network topology changes due to vehicle movement, the system can quickly respond to changes in the topology structure and quickly rebuild the routing system to ensure smooth information.



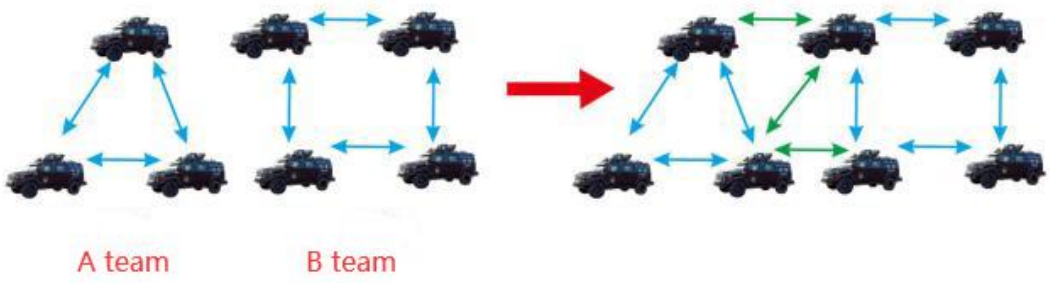
3. Intelligent routing

If the remaining bandwidth of a certain optimal path link is not enough, the MESH wireless ad hoc network can automatically select the sub-optimal for information transmission. As shown on the left of the figure below, when the solid wireless link is full and the vehicle on the leftmost side wants to initiate services to the vehicle on the rightmost side, the transmission path can be established through the upper link shown in the right figure.



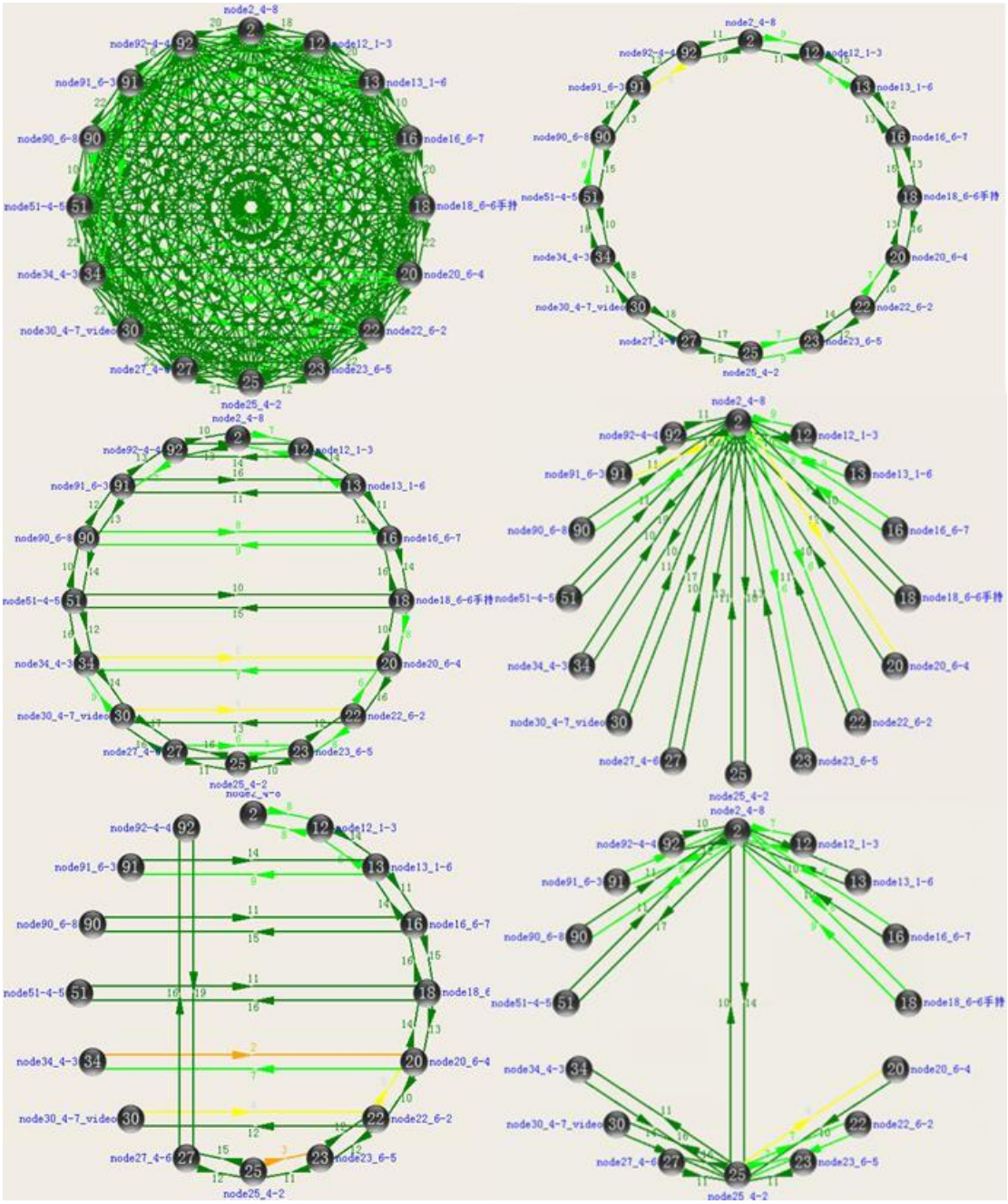
4. Quickly merge multiple teams

As shown in the figure below, the 7 vehicle groups are split into two groups due to geographical isolation: Group A and Group B. The members of Group A and Group B cannot communicate with each other temporarily. When two groups need to collaborate locally and approach again, they can re-integrate into a 7-vehicle group within 2s~4s, and normal communication can be carried out between all 7-vehicle members. The new network topology does not affect the original service transmission.



iii. Arbitrary network topology

The MESH wireless ad hoc network system supports any network topology, such as point-to-multipoint, chain relay, mesh network and hybrid network. The following figure shows a variety of network topology structure diagrams that have been used on the MESH terminal system software.



iv. Fast moving with high data bandwidth

The peak data bandwidth of MESH wireless ad hoc network system is 70Mbps (based on 20MHz carrier bandwidth). Nodes have non-fixed mobile transmission capabilities, and fast movement does not affect high data bandwidth services. Services such as voice, data, and video will not be affected by rapid changes in system topology and high-speed movement of terminals.

V. Anti-interference

Through the external filter, the out-of-band harmonic interference is effectively suppressed, and the anti-interference and signal-to-noise ratio of the signal are improved. At the same time, ARQ (Automatic Repeat Request) transmission mechanism is adopted to reduce the data transmission loss rate and improve the reliability of data transmission. In addition, the built-in frequency sweep function can manually configure and select the frequency that is less affected by interference to set the center frequency point according to the result of the frequency sweep of the allocated center frequency point to achieve interference frequency avoidance.

vi. Multipath Interference capability

The MESH wireless ad hoc network system has strong anti-multipath capability and supports automatic wireless relay transmission. All nodes in the system support multi-hop relay (relay) communication, which can adapt to a variety of terrain and application scenarios. Especially in mountainous landforms, dense urban areas or vegetation coverage, high-rise or deep buildings, basements, subways, tunnels and other scene areas that are difficult or weakly covered by traditional radio equipment, the above-mentioned obstacles cover non-line of sight (NLOS), surface and underground communication Relying on the excellent diffraction and reflection multipath transmission and penetration ability, and then relying on the repeater for effective coverage extension, the anti-multipath relay transmission can be well realized in other demand scenarios.

vii. Disaster tolerance

The MESH wireless ad hoc network system does not affect the use of the entire network when a single node device fails. The wireless MESH network is a mesh network structure. Therefore, when a node in the network fails, the forwarding task originally carried out by that node will be guided by the routing protocol and go through other nodes and select the best transmission path. Following the transmission, the entire network can still self-heal and work normally, which greatly improves the disaster tolerance reliability of the wireless MESH network and has better fault tolerance performance.

viii. Security and confidentiality

The system can effectively prevent illegal users from invading the network by setting the working frequency, carrier bandwidth, scrambling code (ie MESHID), communication distance and networking mode and other "multi-lock" marshalling encryption, which can effectively prevent illegal users from invading the network, only when the above items are completely consistent. In order to ensure legal access to the network; the system is fully independent research and development, the transmission protocol is a fully customized protocol, and the air interface transmission adopts a 64-bit key, which can dynamically generate a scrambling sequence, realize channel encryption, and ensure a high degree of security in information transmission; in addition, the system also Support AES128/AES256 encryption.

ix. All-IP networking interconnection

The MESH wireless ad hoc network system adopts the design concept of all-IP, and currently supports the undifferentiated transparent transmission of various data, and is easy to interconnect with other heterogeneous communication systems (such as public networks, private networks, satellite communications and microwaves, etc.). Real-time interaction of multimedia services.

x. Support multiple services

The MESH wireless ad hoc network system supports the real-time transmission of voice, image, data and positioning information (GPS/Beidou). All nodes can be used in conjunction with the control terminal, and various management and scheduling functions can be realized through the configured MESH ad hoc network terminal system software. The mobile interactive platform configured with MESH ad hoc network terminal system software can also be used to transmit real-time services to mobile terminals.

II. Product Appearance, size and weight

III.Equipment Specifications

Name		Specification
Model		ST9633NC
System parameters		
Frequency		512~582MHz、570~590（U band）、1240~1300MHz、1428~1448MHz（L band）
Bandwidth		5.0/10.0/20.0MHz， flexible and configurable
Modulation		COFDM
Mode		BPSK/QPSK/16QAM/64QAM（Adaptive）
Transmission capacity		Bandwidth to 70Mbps
RF power		2W、1W
Receiving sensitivity		-93dBm@5MHz
Video input		Support IP network video input and wifi video access (HDMI/AV needs to be customized)
Networking function	Networking capability	≥32 nodes
	Network hops	＞8 nodes
	Access time	8s after system startup
	Network topology	No central network, star network, chain network, mesh network, etc.
	Network transparent transmission	Support
Encryption		AES128/AES256
Power		DC12~36V

Product consumption	≤24W
Device interface	
Antenna interface	N type×2
GPS interface	SMA connector
WIFI interface	SMA connector
Ethernet interface	Aviation plug connector
Physical index	
Size（L × W × H）	163*113mm*54mm
Weight	653g
Protection level	IP65
Working temperature	-40℃～+75℃