Stereoscopic Network Architecture Design

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Abstract. Territorial security is an important aspect of ensuring national security. For territorial surveillance of sparsely populated areas, it is often necessary to provide a lot of manpower and material resources to do this work. In view of this, it is very necessary to develop a three-dimensional network which is capable of all-round monitoring of the territorial waters. To establish a Stereoscopic Network, we design a structure including airplane, unmanned aerial vehicles, other equipment and near-ground equipment. Controlling center can monitor the territorial sea situation timely by getting the hardware platform (including the router, ant, and gateway etc.) embedded in these equipment. The access control, the routing algorithm and the resource management algorithm are optimized to get fit in the environments of air and sea. Huge human and material costs could be saved and the result would be significant by this new network structure.

Introduction

The floating machine itself as a temporary space equipment, technology has been quite mature. The flight height greater than 20km, load capacity greater than 200kg, the load area coverage of not less than 300km, can achieve the territorial waters surveillance. The pod on the buoy can be loaded with a large optical camera, which can achieve the purpose of covering a wide range of fast and accurate positioning of the target area, greatly reducing the territorial waters of the cruise pressure and cost. At present, the relevant institutions have designed a large field of view three-dimensional aerial photography system, already has a long flight of high-resolution imaging, large base ratio, airtight and active temperature control design, to automate the characteristics of data processing. It is possible to give two-dimensional image information of the subject in the dynamic process. The range of the float can reach 200km, and when the cruise ship or underwater equipment is moving, it can maintain stable communication over a period of time and switch to the control range of another float when leaving the range of the float. Vessel cruise and underwater equipment monitoring data uploaded to the aircraft gateway, and then by the float to the ground control system. In the event of an emergency, the buoy can also be used for transport.

Space and earth network include satellites, airplanes, ground stations and underwater monitoring equipment. How to network all the equipment, real-time barrier-free communication, real-time and comprehensive monitoring of the sea area is an important purpose of networking. Among them, the aircraft gateway as a monitoring device data uplink communication important hub for each terminal reasonable resources allocation to make network faster and more efficient operation is of great significance. General structure of stereoscopic network system shows in figure as follows.
Network Structure Design

Access Control Module

Effective control of node access enables more efficient management of queues in the uplink to prevent congestion from excessive user access. In order to ensure the stable operation of the network, to avoid network congestion, mainly to the new connection of broadband demand and system available resources to estimate and decide whether to allow the connection access, the function through the access control [1] mechanism, the purpose is to prevent too many users accessed and causing congestion.

Resource Management Module

A larger bandwidth resource is reserved for higher priority services. When traffic data is queued, the higher priority data has a higher probability of sending priority, thus ensuring the communication quality of higher priority traffic. Ground control stations need real-time monitoring of nearby waters, and all operations involving security (such as intrusion of unknown origin) are always the highest priority. In this scenario, the communication service includes not only the data collection and monitoring information of the scene, but also the real-time reporting business of the personnel and the underwater business personnel on the vessel, such as normal, emergency and alarm. When the alarm signal is issued, As much as possible to free up more bandwidth for its services to handle emergencies more timely.

The resource management [2, 3, 4] applies for the resource to the initiated service firstly, and then the gateway allocates the appropriate amount of resources to the service according to the current network overall state, ensures the smooth operation of the network, and the reasonable resource request maximizes the efficient transmission and bandwidth resource of the business data Use, to avoid waste of bandwidth resources and increase system throughput is of great significance. The algorithm of current resource application is mainly based on the estimation of queue length. Based on the estimation of service prediction, the channel model is used to predict the channel state based on the estimation of control theory.

The current bandwidth request mechanism mainly to the following four: dedicated channel, random competition, periodic query, and incidental party system. The core of the on-demand bandwidth request algorithm is an accurate estimate of the required bandwidth to achieve the highest QoS[5] and bandwidth utilization, to avoid traffic congestion, and to reduce transmission latency.
When the resource manager receives the resource application signal from each terminal, the resource manager allocates the bandwidth resource for each terminal according to the certain bandwidth allocation algorithm to ensure the QoS of the service, the fairness of the service and the high utilization of the system resources. The current resource allocation is mainly queue scheduling and full sharing of two ways. The bandwidth allocation mechanism specifies how the resource manager allocates the time slot resources, the reasonable resource request mechanism and the reasonable resource allocation mechanism according to the user's request. It is very important to improve the system bandwidth utilization and improve the system communication quality and efficiency. The allocation of resources in a random competition, fixed distribution, free distribution, dynamic on-demand distribution. On-demand bandwidth allocation according to the characteristics of network services to dynamically adjust the network resources, network resources is an important means of efficient use.

According to the ATM service classification, fixed bandwidth is allocated to certain services to ensure QoS. As long as the total bandwidth of the connection is smaller than the available fixed capacity, the new connection can be accessed. For other non-QoS requirements of the business using bandwidth on demand allocation (i.e. Bandwidth on Demand, referred to as BoD). Keep good balance of fixed capacity and dynamic capacity on demand influence the performance heavily. This should be adjusted by the specific business model and wireless channel model. The difficulty of the method lies in the fact that the business model and the wireless channel model are authentic.

**Literature References Routing Algorithm Module**

At present, there are many studies on the routing of the Internet, the scientific research is also very abundant, and the project is also magnificent. There are many routing methods, according to the number of transmission paths can be divided into single-path routing and multi-path routing. The traditional single-path routing algorithm (such as the Open Shortest Path First Routing Protocol - OSPF) computes only a shortest or cost- least path from the source node to the destination node. Compared with single-path, multipath routing refers to the routing algorithm to calculate multiple paths from the source node to the destination node, and the business according to certain rules assigned to multiple paths on the transmission, the advantage of this routing model is that when a When the link is disconnected or congested, it can communicate through other paths, effectively avoiding network congestion and distracting network pressure.

Considering that the single-path routing algorithm is simple and time-consuming, the multi-path routing algorithm is used at the node where the network pressure is not particularly large and the node is prone to link congestion to reach the node Queue, mitigate link pressure and circumvent link congestion. Based on the link congestion, this paper designs a new routing algorithm, that is, when the network is smooth and the business pressure is small by sending hello packets, the package carries the location information of each node, so as to draw a position on the node The entire network map, according to the current node of the port to the map as the origin of this node is divided into several quadrants. When the link is congested, the destination node of the packet is roughly located in the quadrant according to the previously drawn map, and then forwards the packet to the node in the previously positioned quadrant. Compared with the whole network routing algorithm, this algorithm is more time-saving, the algorithm is simple and easy to implement, and it can theoretically alleviate the queue pressure at the congestion node.

**Conclusion**

Stereoscopic Network Architecture are consisted of many field and would give a new prospect for our new network system, it would be more fast and efficient. And also can make network coverage area broader.
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