ECS Solution

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CONTENTS

1 Overview

1.1 Background and ECS Introduction

Digital conventional communication system combines the advantages of two-way wireless communication and digital technology, and has many advantages and functions of traditional analog system. However, a repeater can only support up to two calls at the same time, resulting in limited use of channel resources, it cannot support more radios to initiate calls simultaneously.

If using the channel machine stack mode to improve the communication capacity, different groups must be locked under different carrier signals, the uneven load among the channels will cause low channel utilization. For example, G1, G2 and G3 are locked to carrier R1, G4, G5 and G6 are locked to carrier R2. If G1 and G2 are talking at the same time, they occupy two time slots of carrier R1. When G3 wants to talk, because there is no channel available, the call will fail even if carrier R2 is idle at this time.

Although the digital trunking system can support automatic channel resource allocation and larger single site call capacity, setting up the trunking system operating environment is complicated and requires support of core network and other equipment. The network construction and maintenance costs are relatively high, and it is not suitable for medium-sized networks.

ECS is an enhanced conventional system developed by Caltta, based on the digital conventional system and combining the advantages of the digital trunking system. Having both advantages of conventional and trunking system, it is easy construction and low networking costs, it overcomes the weaknesses of uneven channel load and low channel utilization when multiple channel machines are stacking in conventional system. The ECS can realize the channel sharing of multiple conventional channels in one site like trunking system, achieving load balance between channels and improving channel utilization.

2 Technical Principle

The ECS system references the implementation of the DMR trunking, when multiple channel machines are stacking, a control channel is designated, all other channels are controlled channels. All radios are locked under the control channel. When the radio initiates a call, the control channel will assign it to a free controlled channel to talk, and at the same time, the control channel will broadcast the group information so that the called radio in the group can switch to the corresponding controlled channel to receive the voice.

In order to increase the channel capacity, the control channel will be used for the call when a call request from the radio is received but all the controlled channels are busy. In the temporarily no control

channel state, the first released channel will be changed to the new control channel.

Voice dispatch and user positioning are two of the most commonly used functions in a private network command and dispatch system. In order to ensure the timely reporting of user positioning, the ECS system supports reservation of dedicated channels for position reporting, reducing mutual interference between voice and positioning and channel collision.

- Each site supports up to 4 repeaters, 8 channels; ECS system supports up to 16 sites interconnection.

- Support GPS dedicated channel, one site can reserve up to 5 channels for GPS reporting.

- One site has up to 1 control channel and 7 controlled channels.

- The control channel is not fixed, in the state that there is no control channel temporarily, when a channel is released, it will be firstly switched to the control channel, and the subsequently released channel will be the controlled channel.

- Each channel needs to broadcast the message of whether there is a control channel, so that the radio can lock the control channel as soon as possible.

- The control channel needs to periodically broadcast the online call information of all the controlled channels, so that the online and late called radios can enter the call as soon as possible.

3 Typical Network Topology

The typical network topology of the ECS system includes radios, repeaters, Ethernet switches, network management, dispatch consoles and other equipment. Each site has multiple repeaters. The repeaters within the site are connected through switches, and the sites can be connected to the WAN through routers, and communicate with network management and dispatch system.
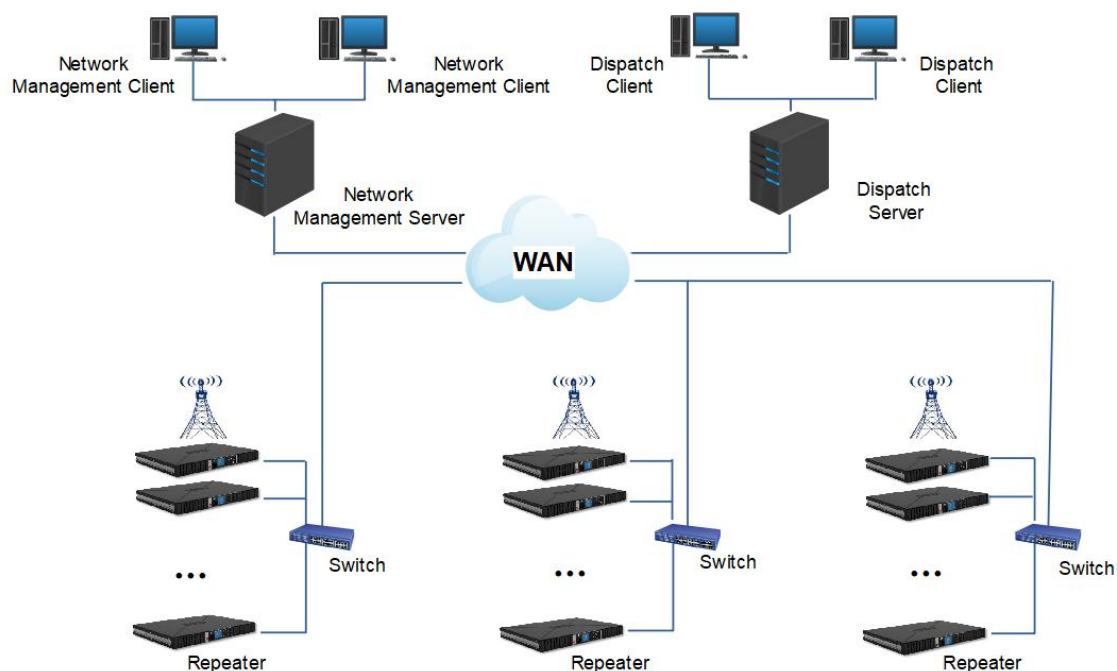
Figure 1 ECS network structure

Network management server, dispatch server, network management client and dispatch client can be installed on one computer together.

Four repeaters within the site must be on the same subnet. Site to site, as well as dispatch server and client, network management server and client, can be in different subnets and be connected through routers.

When multiple sites are interconnected, a repeater must be configured as the master repeater, which is responsible for collecting and broadcasting information such as the access management table of all sites.

4 Solution Highlights

● Easy networking, saving equipment and maintenance costs;

● Flexible channel assignment and load balancing to avoid congestion caused by uneven load;

● Supports reserved dedicated positioning channels to ensure that voice and positioning service free of conflict with each other;

● Avoid the risk of a single point failure, and individual channel failure does not affect site use;

● Support flexible networking across network segments;

● Significantly increase capacity within coverage.