

AN EFFECTIVE METHOD TO ENHANCE THE NETWORK ON MARINE LAYING VESSEL

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Abstract: Due to the complex weather and seabed conditions, marine laying operation is always confronted with risks of cable damages. In order to discover and solve these damages without delay, electrical and optical tests are always conducted periodically during laying operation, which requires clear and in-time communication between marine laying vessel and shore end team. These communications are extremely important to avoid misunderstanding or vessel standby cost. Even during a successful marine laying, an effective network will obviously enhance the experience onboard. However, due to the poor bandwidth or weather-affected satellite transmission, the communication is always not effective enough to transmit adequate and effective messages. In this article a new communication method is proposed to further improve the experience of network during laying operation, which not only helps on communication for cable test on marine lay vessel, but also enrich life on board.

1. INTRODUCTION

It's well known nowadays that the bandwidth on marine laying vessel is usually provided by satellite, and although the high cost of satellite service, the bandwidth is very limited and influenced by weather and coverage condition, therefore the communication between marine laying vessel and outside world is considerably poor. However, during submarine cable laying, continuous monitoring of optical and electrical performance of wet plants is fundamental; especially on marine laying incidents which occasionally happen due to bad weather, unfavorable seabed condition and onboard equipments failure. As such communication between marine laying vessels to the shore end team is imperative, the promptness and bandwidth is of desperate importance because of the high expense of marine laying vessel. At the same time, onboard staff has very limited bandwidth to the internet for daily work, For example, sending emails and exchanging marine cable laying information to the office

headquarter due to the limited bandwidth of satellite. Moreover, as the period of marine laying for long distance system are always time consuming, personals onboard always experience high pressure due to the operational environment situation and poor communication to their family and outside world. Thus it can be seen that an enhanced bandwidth onboard is very important, and it helps improve the working life in many ways. In view of that, this article explains an effective method to enhance the network onboard is proposed, which overcomes the traditional limitations and provides an alternative solution of the bandwidth experience on the vessel.

2. ANALYSIS

During marine cable lay of repeated cable system, in order to monitor the performance of repeaters and fiber, the system is always powered on from the vessel, therefore the voltage drop, gain of repeater and fiber attenuation is monitored by cable engineers onboard.

Item	Objective	Frequency
COTDR	Fiber & Repeater	Continuously
IR	Cable	Periodically

Table 1: Marine Laying Test of Repeated Cable System

During the continuous monitoring of COTDR, all the wet plants are working normally, therefore, besides the WDM equipment in the cable landing station. Another set of WDM equipment is delivered onboard, with additional accessories such as routers, switches allowing the shore end to be extended to marine laying vessel, when cable connectivity is in place. Based on this configuration, the bandwidth will be highly improved compared to traditional satellite use, during marine laying operation.

Except of continuously monitoring the performance of fiber and repeaters during marine lay, a periodical monitoring of insulation is also required. During the preparation of insulation test, cable end in the cable landing station is switched to open circuit, which also requires the communication between marine laying vessel and shore end team. Because the system is powered off during insulation test, the extended bandwidth from shore end is not available. Whereas with the help of Adaptive CTC, the cooperation between marine laying vessel and shore end team is not necessary, onboard cable engineer possesses the initiative to conduct COTDR and insulation test voluntarily, the CTC in the cable landing station will switch the power connection status automatically. Consequently the engineers onboard can perform these tests by themselves and further control the access to the extended network by themselves.

3. RESOURCE OF SHORE END BANDWIDTH

In order to extend the shore end internet to the marine laying vessel, the shore end bandwidth is the first objective, which can be acquired from two sources, either from router

provided by end customer in cable landing station, or from the wireless network, which is further transformed to a wired network by a bridged wireless router.

1) Router provided by end customer

As there is always customer representative onboard for marine laying supervision, in order to enhance marine cable laying experience onboard, application of 10Mbps bandwidth is suggested from end customers.

2) Wireless network

If the end customer cannot provide the 10Mbps bandwidth from router or switch in the cable landing station, such as a newly build equipment room, then a wireless network is practical. The wireless network can be provided by a WIFI, 3G/4G network card, even a mobile phone with hotspot configuration. These wireless networks can further be transformed to wired network by a home use router which supports network bridge function.

4. NETWORK ACCESS AND DISTRIBUTION

After the bandwidth is acquired, additional equipments in cable landing station and marine laying vessel are configured for network access and distribution according to Figure 1 diagram.

When the bandwidth in cable landing station is ready, it is connected to the FE port of a router, and then configured to the 10GE optical interface of the router. The 10GE service is connected to the client slide of WDM transmission equipment, and cross configured to WDM line card, then finally to fiber of submarine cable. In the process of marine laying operation, the repeated system is powered on through PFE onboard to monitor the performance of fiber and repeater, at the same time, internet bandwidth is transmitted to the marine laying vessel through these live fibres and repeaters.

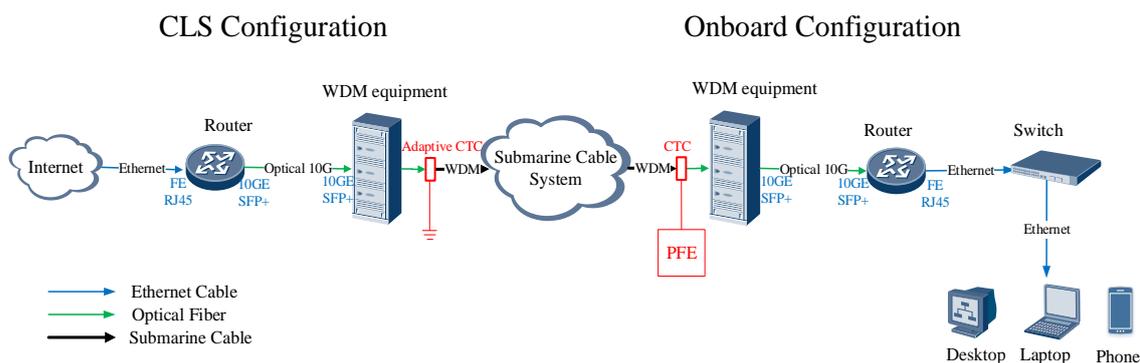


Figure 1: Network Diagram

When the WDM line card receives the signal onboard, the same cross configuration from the line card to client slide card is deployed, and then the signal goes from the client side card to 10GE optical interface of router onboard and further configured to the FE port of the router. The network is finally distributed by switch or wireless router to desktop and phones.

Apparently for submarine cable system, bandwidth of 10Mbps is just a tiny part of its WDM transmission system, and it is considerably easy to expand the extended bandwidth just by reconfigure the router in both cable landing station and marine laying vessel provided the bandwidth source is solved.

Location	Equipment	Configuration	Cost Consideration
Cable Landing Station	10Mbps internet	1, Router or switch provided by customer 2, wireless network	Low cost either from customer or wireless network
	Router	1, 100M FE electrical port 2, 10GE optical port	Low cost for router of 10GE optical interface
	Transmission Equipment	1, 10GE client card, 2, Line card with WDM transmitting platform	Low cost because the transmission equipment is part of submarine system under delivery
Marine laying vessel	Transmission Equipment	1, 10GE client card, 2, Line card with WDM transmitting platform	Another set of transmission equipment onboard to monitor system performance during marine laying.
	Router	1, 100M FE electrical port 2, 10GE optical port	Low cost for router of 10GE optical interface
	Switch/Router	1, 100M FE ports	Low cost for switch

Table 2: Devices List to Extend the Bandwidth from Shore End to Marine Laying Vessel

5. CONCLUSION

According to the configuration proposed in this article, the bandwidth onboard during marine laying operation of repeated system is extremely enhanced, which not only make it more convenient for the communication between shore end team and onboard test engineers, but also make the daily work more easier, which elevates the experience onboard to lay submarine cable system,

which further contribute the smooth operation for marine cable lay. Moreover, a faster internet enriches the life onboard and makes it more feasible to stay connection with family and friends, which is very important for long time away from land on marine laying operation.