ADJUSTMENT AND TECHNICAL SOLUTIONS OF MANAGEMENT SYTEMS (MS) FOR THE LIFE TIME OF A SUBMARINE CABLE SYSTEM

Juergen Ridder, Deutsche Telekom AG, DTAG

Email: <Juergen.Ridder@telekom.de>

DTAG, Global Network Factory, Competence Centre Submarine Cables,
Große Muehlenstr. 10, 26506 Norden, Germany

Abstract: Since the life time of a Submarine Cable is designed for 25 years, its Management System (MS) has to secure the operational surveillance of the system for a long time period. Due to unavoidable aging of the MS components they have to be replaced at a certain time before end of life time of the entire System. Because the IT evolution is going faster and faster, it could be extremely expensive to adapt the new technology to existing submarine cable components. The paper describes, how to manage and maintain the MS of a Submarine Cable System for a long time period on a very cost efficient basis.

1.   IT EVOLUTION EFFECTS MANAGEMENT SYSTEMS

According to Moore's law the number of integrated circuits/transistors are doubled each two years and the IT revolution is going faster and faster. The life time of a new submarine cable system normally is still designed for 25 years, however, most of the systems are retired earlier.

The average life time of a cable system today can be considered with 12 – 15 years. But also unless the life time of the system is lower than its designed life time, it should be considered, that the MS is not always the latest generation once a cable system is installed and ready for service.

As an example, a MS of a submarine cable, which was ready for service in 2001, is based on hardware (e.g. disc drives) and software components, developed end of 90' years. Those components are definitely not available anymore today. Also new software components are not able to run on older hardware components.

This can jeopardise the full functionality of the MS and in worst case as a consequence also the transmission functionality of the submarine cable itself.

The hard- and software support of the entire submarine cable system including the MS is normally guaranteed by the suppliers for the designed life time (20 – 25 years). But as described, this can not be valid for hard- and software components of the MS. That means, in case of faulty hard- and software components in the MS of an older submarine cable system it could happen, that the MS totally has to be redesigned and reinstalled. This could be a very costly solution and will increase the O&M cost of the system significantly.

2.   CONSIDERATIONS DURING COMMISSIONING

In a early stage of a submarine cable project, the future back up possibilities of the MS should already be reflected in the specifications. That means, that not only

the performance data of the system should be a part of the back up solution, but also all software applications (OS, user software, etc) in their original version. In case of a software problem than the correct software version, which has to correspond with the respective hardware can be reinstalled and can guarantee and secure the former functionality of the MS.

Further, the requirements for long term support of the hard- and software components should be specified in detail in the specification. The technical requirements as well as the commercial conditions, especially in regard to the IT generation change, should be clarified in detail in the specification.

In case, the total redesign and reinstallation of the MS of a submarine cable becomes necessary for any reason, the commercial conditions should also be clarified in the specification.

3.   HARDWARE COMPONENTS

As described in chapter 1, cable operators and IT users are facing an IT generation change in a time period of about 2-3 years. If the hardware components of an older submarine cable systems are getting older and going to fail, in most of the cases it will not be possible the replace the same components because they are not available on the market anymore.

 Especially the disc drives are in permanent use and showing a high degree of aging - and again, because of the rapid IT revolution they cannot be replaced after a certain time period. For that reason it would be good a approach to for the cable operators, to build up a fully spare MS of their submarine cable system. This spare MS should be an independent rack, fully equipped and wired and should provide the same functions as the main MS .

The spare rack acts as a stand by MS and offers of a quick switch over in case of a problem with the original MS.

In order to build up that spare MS, the cable operator should take into account and commission the respective number of hard- and software components in the early stage of the life time of a cable system. In case of an older submarine cable system there are good experiences, to buy the hardware components for low cost on the free market (IT broker).

To build up a full function spare MS has many advantages:

1. A full back up system is available on a short notice in case of any trouble with the original MS

2. This solution ensures, that sufficient spare parts for the MS are available at any time

3. All spare parts, included in the spare MS can guarantee full functionality because they are tested during installation of the spare MS

4. The maintenance staff will increase their experience and their knowledge in regard to the MS, because they are deeply involved in installation, testing,etc

5. The submarine cable operator has a chance to reduce the O&M costs significantly. Using this solution, the submarine cable operator can use the MS system of the submarine cable with the original hard- and software components for a long time period and probably for the life time of the system. If the entire MS has to be totally redesigned and reinstalled, it would be extremely costly with a high influence to the O&M costs.

4.   SOFTWARE COMPONENTS

The installation of a submarine cable system and its respective MS normally includes the original software for al components of the MS. But during life time of a submarine cable system, most probably new software versions will be implemented and will change the software architecture of the MS.

 In case of serious trouble (e.g hard disc crash) very often the existing back up software does not reflect the actual internal structure and status of the MS. For that reason, it is absolutely necessary and very important, to update the back up software on a permanent basis and to make it available to all terminal stations of the submarine cable. It also should be secured by the terminal operators from the begin of the life time of a submarine cable system, that the back up software of **all** components of the MS is available to all terminal stations and that all licenses are valid. This will secure, that the MS could be reinstalled in case of trouble without any problems and on a very short notice.

6.   COMMISSIONING OF THE MS

Before a submarine cable system is going into customer service, multiple commissioning tests will be performed in order to secure 100 % functionality of the system. Since the focus is often on transmission, error performance, etc. also a full range of tests have to be performed on the MS has to be tested during the commissioning test phase.

It is highly recommended to include not only test scenarios in the MS supplier and purchaser tests, but also the full back up scenario of the entire MS. That means, that all components of the MS should be turned off and totally reinstalled by using the back up procedures and software, provided by the supplier. Certainly those tests should be performed in all terminal stations of the cable system und should deeply involve operators and maintenance staff.

If a sufficient number of spare parts are commissioned in the bringing into service phase of a submarine cable system, a fully spare MS could be configured and tested.

5.   KNOWLEDGE AND KNOW HOW EXCHANGE BETWEEN TERMINAL STATIONS

Some submarine cable operators have very good experience in focussing their know how on special components of the MS. As an example in a submarine cable system like TAT-14 one terminal station has focussed their expertise on the special parts of the MS, other terminal station on different parts.

A terminal station, specialized one single subsystem, will be deeply involved in all relevant operating and back up items of that respective part of the MS. This will lead to a high degree of knowledge of that staff. Sharing this knowledge with the operators of other terminal stations, that expertise could be used easily by all Maintenance Authorities of the submarine cable system. This could be very important in case of major trouble, since the terminal staff cannot be involved in all parts of the MS with the same degree of expertise.

 Another point is also, that very often the components and the MS of a submarine cable system running without trouble for a long time period. For that reason, terminal staff will loose their experience and they are not in the position for quick and efficient trouble shooting, when it becomes urgent. Having a partner within the operating of a submarine cable system opens the chance to trouble shoot on a cost

effective basis without using expensive external support.

DTAG as one of the TAT-14 Maintenance Authorities has good experiences with those arrangements.

The specialized team of one terminal station also has prepared a " shopping list" for all other terminal stations, in order get all components on the market for building up a spare MS. Also an installation and an test guide line has been prepared from that specialized team and distributed to all other terminal stations. This is a very good approach to all terminal operator staff to make familiar with the MS .

7.   UPGRADE OF A SUBMARINE CABLE SYSTEM

A system upgrade is favourable option to increase the design capacity of an older submarine cable system. In most of the cases, the MS of the upgrade capacity will be installed totally independent from existing system capacity. As an example, within TAT-14 the MS of the original capacity is based on OS Unix and handles also the Wavelengths Terminating Units (WTU) surveillance and the repeater interrogation. The MS of the upgrade capacity is based on MSWindows and therefore totally different. It would be to expensive to integrate all those functions in to the MS of the upgrade capacity.

 However, an upgrade of a cable system extends the life time of a submarine cable system. That means, that also the MS of the original system has to live for a longer time period and therefore needs the attention as described.

7.   SUMMARY

The intention of that paper and the poster session is to raise a discussion on the long term functionality of MS of a submarine cable system. Further to make submarine cable operators familiar with the importance of the long term technical support. Also one purpose of the paper is discuss the own skills and possibilities of the involved maintenance staff to ensure the survival of the MS during the life time of a submarine cable system.

 The paper could be the basis of discussion between the cable operators as well as between cable operators and the suppliers.

Within the poster session, it could be discussed and described in detail, how to be prepared, if the MS of a submarine cable is not in the technical stage, to survive the life time of the entire system.

Since all cable operators are living in difficult financial environment, one major motivation of the paper / poster session is, to find compromise between a safe operation and the reduction of O&M costs.

The focus is also on development of the own skills of the cable operators in regard to the technique of the MS. To limit external support and expertise will reduce the costs of operating the submarine cable

Taking into account this, cable operators could be in the position, to use their MS in submarine cable system with the full and secured functionality for the life time of the system and last not least with a high degree of knowledge.

8. REFERENCES

No references in the text .

(The paper is based on excellent experiences within the TAT14 MS architecture und Maintenance Procedures).