Implementing UMS to Improve Efficiency of Optical Fiber Path Testing

Shigeru Numahata, Hidemitsu Yamazaki, and Kiyoharu Sasaki

Abstract

NTT EAST routinely carries out testing of optical fibers as part of maintenance efforts to ensure that optical fiber cables are sound. Equipment for testing optical fiber paths is installed in all telecommunication buildings; if this equipment is fully utilized, testing with high efficiency and precision can be put into practice because it will be unnecessary for network technicians to go to the actual locations of the cables. However, although this testing procedure is more efficient, improvement is still required because some of the procedural operations need to be repeated. In this article, we explain how our unified management support system can be applied to solve certain problems.

Keywords: UMS, testing of optical fibers, optical fiber path testing

1. Introduction

NTT EAST periodically tests core fibers in order to determine the condition of optical fiber cables and to properly maintain them to prevent malfunctions. Optical fiber cables in telecommunication buildings are mechanically terminated in racks. Therefore, one testing method requires a tester to go on site and measure each fiber one by one with portable testing equipment. Another method involves using optical-path testing equipment installed in each telecommunication building to do these measurements automatically (see **Fig. 1**). This testing equipment can be controlled remotely, so optical fiber cables can be tested without the tester having to leave the maintenance base. The Great East Japan Earthquake of 2011 prompted a review of procedures, and consequently, application of the unified management support system (UMS) for emergency testing during times of natural disasters is under consideration. That is, the implementation of UMS is gradually being expanded starting with major telecommunication buildings.

One concern with performing emergency testing in practice, however, is that the testing work done by operators takes too much time. This is because optical-path testing equipment is optimized for performing automatic testing on a routine basis under predetermined test conditions and time intervals (usually ten days). Consequently, when testing is attempted over a wide area immediately after a disaster has occurred, it is necessary to reset the test conditions. In other words, if a large quantity of optical fiber cable is targeted for testing, operators must repeat the setting operation until they have set the test conditions for the core fibers of all optical cables and all telecommunication buildings. This kind of methodical and tedious work often results in human error, which can lead to test-target oversights or other problems as a result of the incorrect operations.

In considering how to investigate these problems and solve them somehow, we focused our attention on UMS. In particular, we thought that if UMS could be applied to automate these repeated setting operations, optical fiber cables could be tested automatically in an error-free manner without having to carry out a costly upgrade of programs (**Fig. 2**).

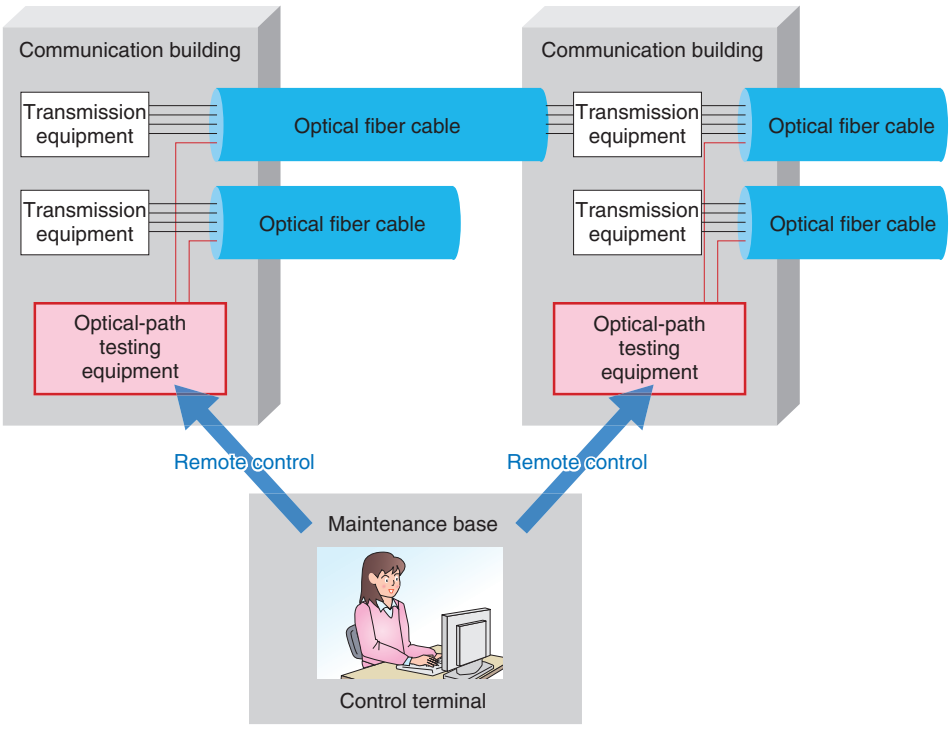

Fig. 1. Image of optical paths testing.

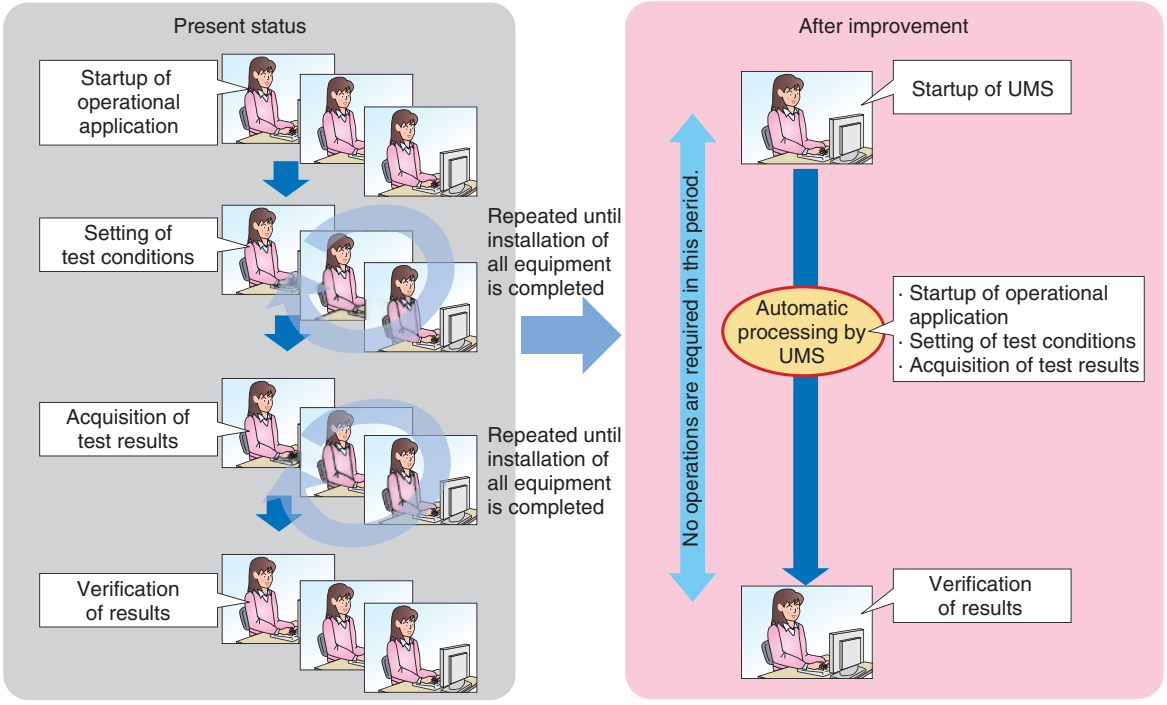

Fig. 2. Improvement in testing process achieved by implementing UMS.

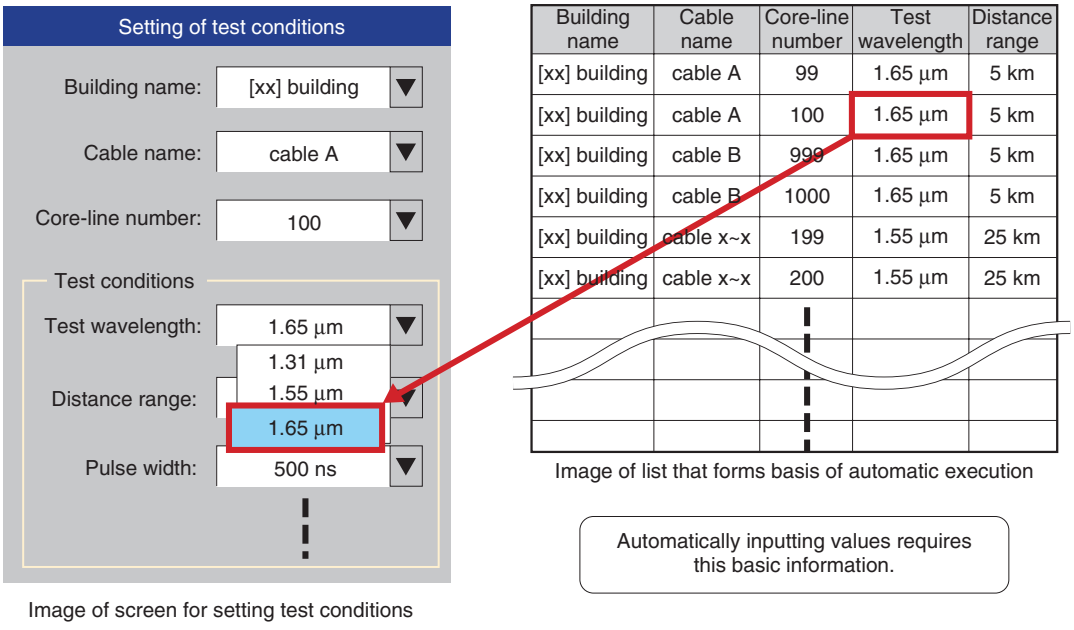

Fig. 3. Image of list forming the basis of automatic execution.

2. Activities targeting routine testing work

The momentum generated by investigating applications of UMS has improved the efficiency of emergency testing of optical fiber cable after disasters. However, while our investigation on applying UMS was underway, we became aware of the struggles of operators who were performing the repetitive operations during the ordinary periodic testing that still had to be done. If the efficiency of such regularly generated periodic-testing work could be improved in conjunction with that of emergency testing, it would be possible to achieve greater improvements, and UMS could be applied without hesitation in times of emergency by operators who had become familiar with it on a routine basis. Given these considerations, we have been making efforts to make this automation possible in regard to periodic testing as well.

3. Targets for automation

We initially chose only the repetitive operations concerning optical-path testing equipment as targets for automation. However, as we continued our investigation, we realized that true improvements in efficiency would not come from targeting only those operations, and therefore identified some other targets.

3.1 Automatic creation of list forming the basis of automatic processing

An example of such an improvement concerns creation of the list that forms the basis of automatic execution. Before UMS can be run, it is necessary to create a list that defines the data and all input details of the target processing operations as well as to create a scenario defining a sequence of operations. In this example, that creation process involves information including the telecommunication building name, optical fiber cable name, core-line number, and test conditions. Creating that list requires either inputting all data by hand from scratch or downloading information registered in optical-path testing equipment as comma-separated values (CSV) data and processing that information using a spreadsheet such as Excel. Acquiring the CSV data is also a repetitive operation, and therefore, if many targets exist, a considerable amount of time and effort is used up on those repeated operations. Moreover, once the list is created, the work is not complete; that is, the list must be updated for testing at times of emergency. However, in preparing for times of emergency, we want to avoid imposing extra burdens on operators. Accordingly, we thought it was necessary to automate the creation of the list (which forms the basis of automatic execution) itself (see **Fig. 3**).

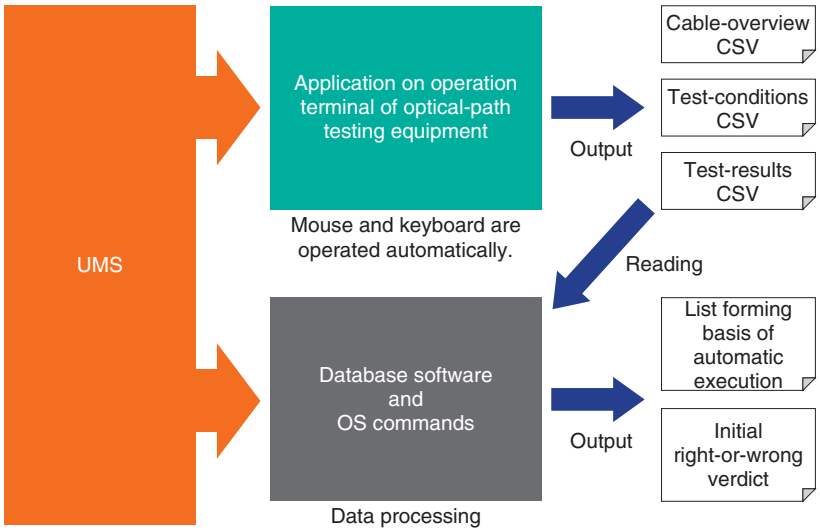

Fig. 4. Schematic image of linkage of UMS with other programs.

3.2 Automation of initial judgment of rightness/wrongness

We realized that in addition to automatically creating the base list described above, being able to simply acquire the results of emergency testing and regular testing automatically was insufficient in regard to improving efficiency. In other words, when the amount of data becomes excessive, analyzing right-or-wrong judgments requires a lot of work. To solve that problem, we added a function for simply judging variations beyond a predefined value (by comparing past and present test results) as a target of automation. This function makes it possible to narrow down all targets for detailed verification.

3.3 Method for solving problems

The above-described problems cannot be solved by only automating the operation of the optical-path testing equipment. That is to say, it was necessary to first import each CSV file that is output from each piece of optical-path testing equipment into a commercial relational database and process it there and then to match it with execution of OS (operating system) commands. UMS has a function for calling up other programs and consecutively executing them in order, and applying that function made it possible to automate all processing sequences (**Fig. 4**). This function makes it possible to flexibly handle complex processing, and it indicates that UMS is an effective tool for covering a wide range of operations.

4. Future initiatives

At present, we are conducting trials of UMS in cooperation with the Saitama branch office of NTT EAST. These trials have demonstrated that UMS improves the efficiency of periodic-testing work. From now onward, we plan to continue the horizontal expansion of UMS to all branches in cooperation with operations management.

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