Effective Methods for Testing Year 2000 Compliance

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Effective year 2000 (Y2K) testing must be performed using a process. The process for Y2K testing described in this article is based on experiences from many of the approximately 1,000 corporate members of the Quality Assurance Institute (QAI). By using this process, you will benefit from the experiences of leading corporations in addressing the Y2K problem. The nine steps in the process are designed to lead testers from the initiation of the Y2K testing effort to the writing of the final Y2K test reports and verifying the correctness of installing the Y2K changes into production.

Before developing a test strategy, tactics, and plan to test Y2K compliance, testers need to consider certain "concerns"—conditions that if present increase the probability that testing will not be effective. Identifying these concerns early and addressing them in the testing plan will help reduce the negative probabilities associated with those concerns.

The following 15 testing concerns are areas the testers need to address.

- **Organization's track record on completing projects on time.** If your information services organization has a history of missing scheduled dates, *there is a high probability it will miss the date for making Y2K changes.*
- **Organization's track record on completing projects within budget.** If your organization has a history of being over budget on software development projects, *there is a high probability it will not be able to complete Y2K changes with existing resources.*
- **Maturity level of organization's development process at the time programs were written.** If your organization developed systems that were not Y2K compliant with a Capability Maturity Model (CMM) Level 1 development process, *it will be much more difficult to change and test than projects written at Levels 2 through 5.*
- **Currency of program documentation.** If the documentation represents the code in the program, both changes and testing *will be easier than if the documentation is out of date and cannot be relied on by either the Y2K team or the Y2K testers.*
- **Amount of program documentation.** If the documentation for programs meets the documentation standards of standard-setting organizations such as the Institute of Electrical and Electronics Engineers, International Organization for Standardization, and the National Institute of Standards and Technology, *the ability to find and correct problems as well as conduct test methods will be significantly enhanced than in programs that are sparsely documented.*
- **Amount of renovation to be included in the Y2K projects.** If, in addition to making date changes, significant renovations, i.e., modifications and enhancements, are made, *they will increase the difficulty and potential problems associated with making and testing the changes.*
- **Effectiveness of estimating procedures.** If the organizations that estimate procedures are realistic, the estimates for both implementation and testing will be representative of the effort required; if the estimating process is not realistic, *there is a high probability that inadequate time will be available for testing.*
- **Lack of skilled testers.** The testers need the skills associated with testing the systems that are changed. They may require knowledge of obsolete languages, tools, and testing procedures. If the testers do not possess the necessary skills, *they will not be able to properly carry out the procedures.*
- **Down-sized or burned-out staff.** If information services has been understaffed for a time, *the staff may not be in a position to expend the extra effort needed to effectively complete Y2K changes on time.*
- **Likelihood of litigation.** If there is a high probability that inadequate Y2K compliance will result in litigation from customers, suppliers, stock holders, etc., *the testers will need to spend extra time and effort to both document the test processes and the results of the testing.*
- **Lack of Y2K change tools.** The individuals responsible for changing the Y2K date procedures need tools to help them search for the date problems and to make corrections. The fewer tools they are given, *the higher the probability they will not correctly identify and implement the needed changes.*
- **Lack of Y2K test tools.** Testers need the tools that will enable them to conduct one of the largest test assignments many will experience in their testing career. The lack of effective tools to test Y2K compliance *will inhibit the effectiveness of the testers and most likely increase the amount of resources needed for testing.*
- **Importance of new projects.** Experience has shown that many of the resources within an information services group will need to be diverted to make and test Y2K changes. If new projects have a higher priority for resources than the Y2K compliance project, *changes will be more difficult.*
- **Lack of adequate testing resources.** Estimates for testing Y2K compliance range from 50 percent to 75 percent of the total change effort. Finding those resources to perform the testing may be difficult. Lack of adequate testing resources *will result in shortcuts or omission of some changes in testing.*
- **Lack of adequate testing time.** One of the challenges testers face in any

software development project is that they are the last to work on the project. If the previous phases for Y2K compliance take longer than expected, *they will erode the amount of testing time available and thus reduce test effectiveness.*

Any Y2K test process that is going to be effective must address these 15 concerns. The concerns can be addressed by either resolving them immediately or incorporating appropriate tactics in the test plan to resolve or minimize the potential impact of the concern.

The Nine-Step Y2K Testing Process

The Y2K testing process used by the QAI follows the traditional "V" concept of testing (see Figure 1). The V shows the three major components of the Y2K correction process and the nine steps of the Y2K testing process. The first two steps of the correction process involve a verification process and test. The last step of the correction process is validation by an operational execution of the corrected software. The final step is the preparation of the report describing the results of implementation and testing.

A brief description of the nine-step Y2K testing process follows.

Step 1: Verify Y2K Assessment

The Y2K assessment scopes the size of the Y2K computing crisis and is a prerequisite to determining the effort required to correct the problem. Neither the implementation effort nor the testing effort can be determined until the scope of the problem is defined. It is the equivalent of the requirements or need definition component of new software development. During this step, the testers will challenge the completeness and correctness of the assessment performed to determine the scope of the Y2K computing crisis.

Step 2: Develop Y2K Test Plan

The scope of the Y2K test effort necessitates the development of the test plan. To expend the amount of resources needed for Y2K testing without a plan will probably lead to wasting valuable testing resources and the inability to

make an evaluation of the status of the correction effort prior to Jan. 1, 2000. The test planning effort for the Y2K test project should follow the normal test-planning process; however, while the structure of the plan will be the same, the content will vary because it will involve not only software developed in-house but also supplier-developed software and software embedded into computer chips.

### Step 3: Verify Supplier's Compliance Capability

Software provided by a supplier through purchase or contract poses the same Y2K computing crisis as software developed in-house. However, unlike software developed internally, organizations do not have direct control over supplier plans, projects, and employees. If the supplier has made Y2K corrections or built the software so that it is Y2K com-

pliant, validation can be performed to determine whether that software is Y2K compliant. On the other hand, if the supplier is undertaking efforts to make software Y2K compliant, the execution of that software may not be known until almost Jan. 1, 2000. In the interim, at least for critical software, organizations should perform an assessment of the supplier's capability to make the software Y2K compliant.

Step 4: Verify Internal Compliance Capability

The organization's ability to achieve Y2K compliance on internally developed systems should be defined by the Y2K compliance plan. The more detailed the plan, the easier it will be to verify the adequacy and the completeness of the plan. In this step, a detailed review process to examine the plan will need to be implemented. The review process in-

Figure 1. *The nine-step Y2K test process.*
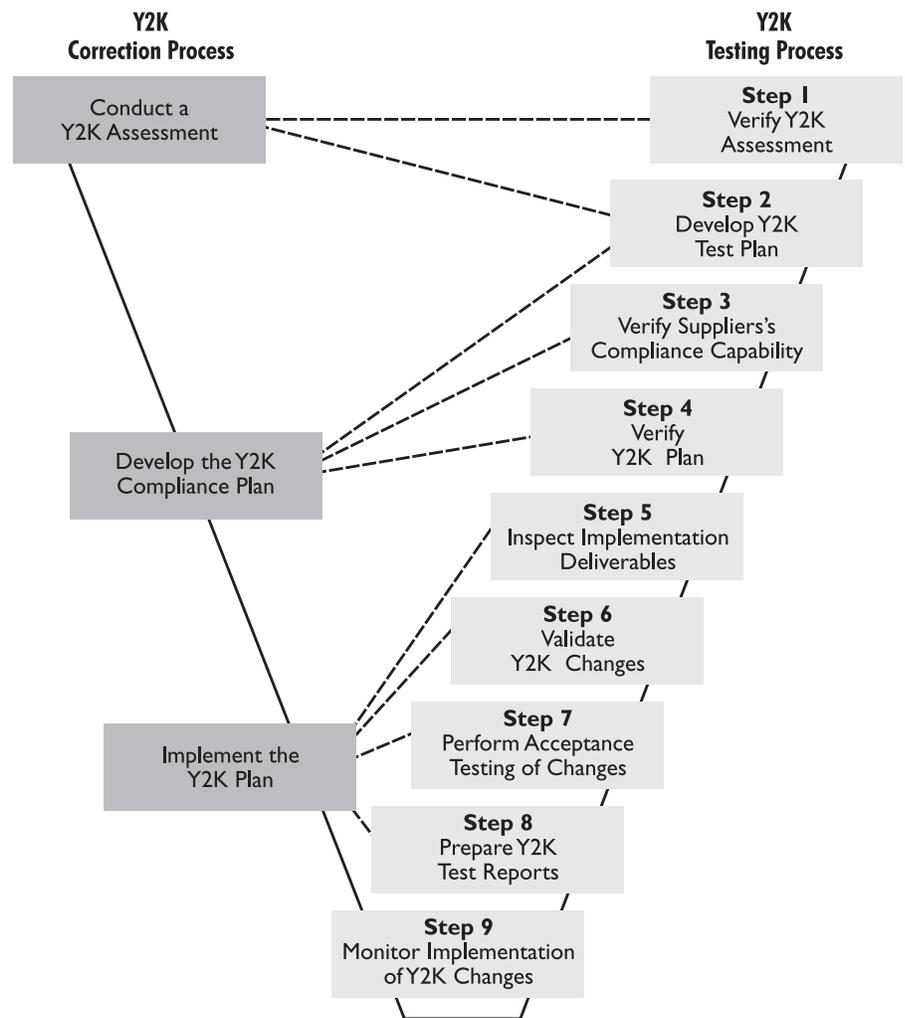
volves establishing a review team for its total competency and assessing all aspects of the plan. The review process will conclude with the preparation of a report, which will detail the strengths and weaknesses of the plan together with recommended improvements.

Step 5: Inspect Implementation Deliverables

In this step, the corrected software will be inspected prior to executing the software. The inspection process is used because first, it is more effective in identifying defects than validation methods; and second, it is much more economical to remove the defects through inspection than through unit or system testing.

Step 6: Perform System Testing of Changes

For this step, many types of test data that may be needed to perform effective Y2K testing will be identified. The test plan is decomposed into specific test transactions that will be used to validate the performance of the operational system. It is assumed that the developers will perform unit testing.

Step 7: Perform Acceptance Testing of Changes

The system testing will evaluate the functional and structural components of the software that has been changed. It will attempt to determine that the systems are Y2K compliant. Acceptance testing is a test performed from a user perspective. Acceptance testing may be necessary for any of the following three reasons.

- **Potential Regression.** The system may not perform the tasks that were performed previously because in correcting the Y2K date problem, other processing components could be negatively impacted.
- **Enhancements.** Many organizations will make enhancements to the system at the same time they make the Y2K correction. This will not necessitate determining that the enhancements were corrected from the user perspective.
- **Performance Changes.** This system may process correctly but due to the

Y2K date, change in performance may be negatively impacted. For example, in the correction process, it may increase the amount of time required to provide on-line responses, which could have a negative impact on the user's business.

Step 8: Prepare Y2K Test Reports

There should be both interim and final test reports. Interim test reports are needed for both testers and management. The testers need to know the status of testing and the status of defect identification and correction; management needs to know the status of the overall project effort. Management will also need to know, shortly prior to Jan. 1, 2000, the status of the Y2K change efforts and what risks the organization faces because of that status. This step is to enable the tester to verify that what was tested, reported on, and accepted has been correctly installed in a production status.

Step 9: Monitor Y2K Implementation Changes

In this step, the organization needs to address actions that testers could take that relate to the magnitude of changes that will be occurring during the Y2K correction process. For example, while date changes are being made, business may be needed for the software; therefore, one version of the software will be under development for date changes, while another version will be modified for business changes placed in the operation. In addition, changes to the process of making date changes will be incorporated. During this step, issues such as version control, change control, and control over the testing process during the dynamic change environment will be dealt with.

Summary

The Y2K program is expected to be the largest and most complex system conversion effort undertaken for many organizations. Because of the complexities and scope of the Y2K problem, it is critical that organizations develop comprehensive plans that establish schedules for all tasks and phases of the Y2K program, set

reporting requirements, assign conversion or replacement projects to Y2K project teams, provide measures to assess performance, and anticipate the need for risk assessments and contingency plans.

Ironically, perhaps, the enormous challenge involved in achieving Y2K compliance is not technical; it is managerial. Whether organizations succeed or fail will be largely influenced by the quality of executive leadership and program management. Executive leadership sets the tone; program management makes change happen. It will be imperative for top management—including the chief information officer—to not only be fully aware of the importance of this undertaking but also to communicate this awareness and urgency to all employees in such a way that everyone understands why Y2K compliance is tremendously important. That urgency must also include planning and executing the test segment of the Y2K program. ◆

About the Author

William E. Perry has been the executive director of QAI since 1980. He is the author of more than 50 books, including *Surviving the Top Ten Challenges of Software Testing, Effective Methods for Software Testing, A Structured Approach to Systems Testing,* and *Year 2000 Software Testing.* A certified quality auditor and certified software test engineer (CSTE), he realized the need for a practitioner-based conference for software testers 18 years ago. This conference has been a favorite among testers ever since. He started the first certification for software testers, CSTE, at QAI. He has a master of business administration degree from Rochester Institute of Technology and a master of education degree from the University of Rochester.

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