

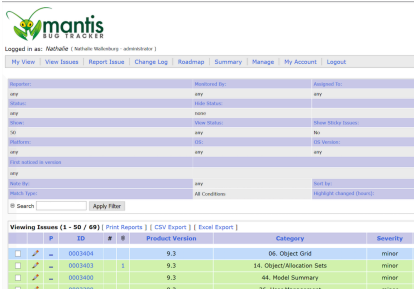
How we Develop & Test CostPerform

Since 2001 we develop and deliver CostPerform business software that helps companies to better understand and manage their costs and revenues. We develop and test the product in-house. This factsheet describes the way we develop and test.

How we develop

Developing a product like CostPerform is a continuous process. The moment we release a new version, the developers are already working on a newer version. The development is guided by our **Roadmap**. This roadmap contains high-level descriptions of new functionality or themes. Our management updates this roadmap regularly by adding their own ideas and by listening to ideas coming from our business partners & clients. The roadmap items are translated into detailed specifications of functions and their interaction with existing functionality.

Like in any software, clients find & report bugs. These bugs are recorded in our bug track system called Mantis. The developers reproduce the bug and fix the bug by changing the source code. Every developer tests if the bug is fixed.



Our partners and clients can also file change requests. Each request is described with text and examples and is also added to Mantis. Both developers and management evaluate the change requests either to allocate them to a future version or reject them.

The development process has 3 steps. In the (1) design phase, roadmap items, bugs and change requests are clarified, specified and finally (2) coded. Before committing any code change, the developers (3) test their change. They check if their code change was successful. Did it fix the bug or does the new function work as it was specified?

Alpha testing

At a certain moment in the development process the Alpha 1 is made available to the test team. The first action of the test team is

to test if the reported new functions and the fixed bugs are working as specified and/or are really fixed. Of course the testers find deviations and report that to the developers to be fixed. If after several Alpha versions all changes work, the first Beta version is build and a feature stop is declared. From that moment on, the official Beta test cycle starts.

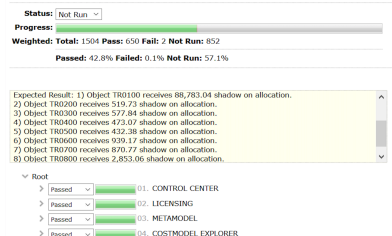
Beta testing

The official Beta-test cycle we use both manually and automated regression-testing techniques.

Our test team performs **manual regression testing** by following a pre-defined test script. For each function in CostPerform there is a set of checkpoints to check during manual testing. These checkpoints (or test items) are stored in our homemade testing tool called **Probe**.

Test cases

In SQLServer2014 - V9.3 since Beta 2



Since our software is available in stand-alone mode and in client server mode and can run on 3 database systems with several versions we run a complete test cycle for at least 5 combinations. In each Beta version, one combination is tested. The test team installs the required combination and starts to test each item. The item instructs the tester what to do and what to expect. If the result of the test is exactly the same as the expected and described result the item passes. If the 1600 test items per cycle all pass, the test team starts with the next combination of mode and database. In case a test item fails, the error is treated as a bug and is added to Mantis. The tester that found the error describes the error and the way to reproduce it. The developers pick up the bug and fix it.

We test the calculation function with an automated regression test. Since the start of the CostPerform development, we made test models (with excel-based proof of result) and we collected real life models from clients (with permission and made anonymous) to be part of the **calculation reference database**. Today, this reference database contains over 38 costs models and for each cost model we know that the results are correct. A script compares the results from our reference database against the results of the tested database. Every object-attribute value combination and even allocation-attribute combination is compared. The script produces an exception report in case of a difference between reference and tested database. In case of differences, the test team reports the errors in Mantis.

This process of manual and regression testing is executed per Beta-version.

In a regular release we have between 5-8 beta versions.

Release testing

Once the last Beta version is approved, we release a Release candidate (RC). This RC is tested for 5 combinations of mode and database. Each combination gets a full test cycle. In this phase, we also involve some of our business partners by asking them to test the RC in their own way. In case errors are found, they are fixed and the next RC version is tested again for all combinations. Just before we release the official version, the test team checks if the user manual is up to date and the release notes are complete and correct. If all signs are green, we release.

Conclusion

Testing CostPerform is pretty labor intensive. For every new release -on average- we execute 30 complete test cycles. We spend about 30% of our technical capacity on testing. The reward of this intensive testing is a good reputation and only a few real bugs after the release.