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DE 15E NEDERLANDSE TESTDAG



NOVEMBER 4, 2009
TECHNISCHE UNIVERSITEIT EINDHOVEN
AUDITORIUM - BLAUWE ZAAL

TU/e Technische Universiteit
Eindhoven
University of Technology

Where innovation starts



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PREFACE

Dear Testing Day visitor,

A warm welcome to the 15th edition of the Dutch Testing Day. We would like to take this opportunity to thank those who contributed to its success. Within a week of announcing the possibility of registration, we were completely booked, illustrating the relevance of the Testing Day as an exchange forum for academia and industry.

This year's Testing Day is collocated with a number of scientific events dedicated to Formal Methods and their application. Our opening keynote presentation by Ed Brinksma will take us back to see whether we have made progress over the past 20 years.

We would like to thank all authors for their willingness to submit their proposals for presentation to the Testing Day. This year, the call for abstracts attracted 31 high-quality proposals. In keeping with the best traditions of the Testing Day, we have composed a programme that strikes a balance between industrial and academic presentations. A total of 7 proposals have been selected for our plenary session, and in addition to these, we selected a number of abstracts for the poster sessions during the coffee and lunch breaks. You will find that the more intimate atmosphere will facilitate the exchange of ideas in these informal sessions.

Finally, a special word of thanks to our sponsors. Their willingness to sponsor this event has made it possible to continue the tradition of attending this event free of charge. Despite the financially troubled times, the large number of sponsors that have committed themselves to the Testing Day once more emphasises the importance of the Testing Day. Please, take the opportunity to have a word with our sponsors at their stands in the exhibition hall.

We hope you will find the programme inspiring and wish you a very instructive and above all pleasant 15th Dutch Testing Day.

Tim Willemse and Frank Stappers,
Technische Universiteit Eindhoven

PROGRAMME

- 09.15-10.00: Registration and coffee
- 10.00-10.10: Opening words by Frank Stappers and Tim Willemse
- 10.10-11.00: **Keynote**
Ed Brinksma
- 11.00-11.30: Coffee break
- 11.30-12.00: **Testing Based Modelling**
Maarten Damen, Wouter Geurts, Michel Reniers
- 12.00-12.30: **Specification-based Testing of Object-oriented Programs with T2**
Wishnu Prasetya, Tanja Vos
- 12.30-14.00: Lunch
- 14.00-15.30: **A check on the testability of requirements and designs and preserving review information**
Jef Bergsma
- 14.30-15.00: **Do Services Require Online Testing? A Case Study!**
Michaela Greiler, Arie van Deursen, Hans-Gerhard Gross
- 15.00-15.30: **Testing in the medical world; practical experiences with the FDA (audit)**
Patrick Duisters
- 15.30-16.00: Coffee break
- 16.00-16.30: **Cheaper load testing using fewer simulated users**
Pim Kars
- 16.30-17.00: **Things to consider before applying TTCN-3**
Erik Altena
- 17.00-17.15: **Closing words**
- 19.00-19.30: Coffee
- 19.30-21.30: **Soirée**
- 21.30: Cheese and drinks

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PRESENTATION ABSTRACTS

TESTING TIMES: 20 YEARS OF RESEARCH AND COLLABORATION IN TESTING

ED BRINKSMA

UNIVERSITY OF TWENTE

The interaction between the field of formal methods in computer science and the practical needs of testing (embedded) software systems is now more than 20 years old. In our talk we will give an overview of the main developments over the years, and the context in which they took place. We will try to give an account of what worked, and what didn't, and analyse the reasons behind the successes and failures. Finally, we will also try to look ahead and see what are the main challenges for the future.

Bibliography

Ed Brinksma is professor of formal methods and rector magnificus at the University of Twente. In the period 2005-2008 he was the scientific director of the Embedded Systems Institute. In his research he has always been very involved in both the theory of formal methods and their application in many different fields, one of which is testing.

TESTING BASED MODELLING

MAARTEN DAMEN

WOUTER GEURTS

MICHEL RENIERS

DESIGN AND ANALYSIS OF SYSTEMS
TU/E

LOGICA

DESIGN AND ANALYSIS OF SYSTEMS
TU/E

Models and model based techniques are valuable not only to construct software but also to perform maintenance on existing software and to prove a certain level of quality of the software. The modelling activity itself is different from the currently used development techniques. Therefore modelling is mostly seen as 'additional cost' and 'a heavier burden' for the main resources. This means that models are not made, or (worse) modelling is stopped half way.

Secretly, always at least one model is made: the actual system. Knowing that there is a model gives rise to the question: "Is it possible to extract the model not from the head of the analyst, but from the system itself using the observation of visible properties?". In this work we narrowed the research down to event driven systems for which the observation of the properties has been logged in interface log files.

We propose and demonstrate a technique that takes a trace of the system and produces a model. The technique consists of two consecutive steps:

1. modelling of time driven events, and
2. modelling of spurious behaviour, which is all the other behaviour.

For the first step, we apply a technique of identifying 'model templates' (e.g. periodic timers) and assign a subset of the events in the log to events following from the model template. These time-driven events and their periods are then represented by means of timed automata. The technique that in a first step separates the time driven event from the spurious behaviour was really successful. Even for the case that there were timers that could be switched on and off, we were able to determine the event as being time-driven and to determine the period of this kind of time-driven events.

For the second step, a model is constructed from the spurious events from the trace. For this phase, some ideas are roughly sketched, but this needs much more work to be useful. The idea for the used approach was that we would only go to a new state in the automata if the last seen input/output combination was contradicting with the current state. Note that this gives rise to much more possible traces than may appear in the log file, while the classical approach is restricted to the traces that occur in the log file. The research ended in proposals for feasible expansions of the methods.

In this study the general conclusion on model-based techniques is confirmed that the method leads to insights in the actual system by finding anomalies and asking direct questions to the system experts.

Research funded by ITEA/TWINS, TU/e and Logica/Working Tomorrow

Bibliography

Maarten Damen is an ex-student at TU/e, who performed his master education there. During his master project, about reversed engineering based on log data, he got involved in the process of model-based reversed engineering on which the concept of testing based modelling is build.

Wouter Geurts is Lead Expert on Engineering within Logica Netherlands. He has ample experience in the domain of mission critical (control) systems where focus on the right balance in processes, tooling and people skills is crucial. Model based working touches all of these three areas.

Michel Reniers works as an assistant professor at TU/e. His research focuses on the development and use of (semi-)formal methods that aid in the development of discrete event, real-time, and hybrid systems. Since 2007, he is involved in the ITEA project "Optimizing HW-SW Co-Design Flow for Software Intensive System Development".

SPECIFICATION-BASED TESTING OF OBJECT-ORIENTED PROGRAMS WITH T2

WISHNU PRASETYA

TANJA VOS

DEPT. OF INF. AND COMP. SCIENCES,
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DEPT. DE SISTEMAS INFORMATICOS Y COMP.,
UNIV. POLIT. DE VALENCIA.

T2 is an open source, light weight, and versatile automated testing tool for Java we developed at Utrecht University. It relies on in-code specifications written in Java, thus requiring no additional tool to keep them in-sync (which otherwise is often a big maintenance issue), nor special programming skills to write them. T2 is distributed as a library and carries no dependency on other tools, so that it can easily integrate with other tools (JUnit, IDEs). It is fast, capable of injecting thousands of tests in a second, and is suitable to support specification-based testing. It can deliver 70% coverage with a button push.

Given a target class *C*, T2 does not test each method of *C* individually. Rather, it tests *C* as a whole by generating test sequences, each consisting of calls to *C*'s methods. This has the side effect that methods will be checking each other, therefore even if the methods are individually only partially specified, their conjunction acts as a stronger oracle. T2 is good for testing a single class, but it is versatile enough to handle an application provided dedicated classes are provided, that act as test interfaces. However, when testing an application modularity, and consequently also maintenance, becomes a bigger issue. In Java it would be very tempting to just adhoc-ly wrap our methods with in-code specifications. But in an application with multiple aspects to specify, such an approach will quickly result in heavily cluttered, unmodular, and thus unmaintainable code.

This presentation will give a quick introduction to T2, then show a more advanced use of T2 via specification classes. These are ordinary Java classes, but are used specifically to group related specifications together and separate them from the class they specify. Abstractly they can be thought as organized in five sections, e.g. (*Abs*, *Ops*, *I*, *A*, *T*). *Abs* is a set of functions providing abstract views into the SUT's concrete state. *Ops* are the operations available for driving SUT from one

state to another. They can be specified with usual Hoare triples, but additionally we also have the I to specify class invariants. A is a set of algebraic specifications, which is different than a Hoare triple because they specify relations between the operations. T is a set of temporal specifications. All specification elements are required to be closed over Abs , which implies that Abs can be used as a mechanism to enforce our abstraction level. We will show some examples of how to express these. A specification class can also be 'extended' by adding, removing, or refining its elements, so that we can incrementally and modularly build our collection of specification classes and avoid cluttering. We will also show how the same concept of 'extension' can be used as a framework to modularly inject a non-functional aspect like state-based coverage requirements and custom values generators.

References

[1] More on T2 can be found in <http://T2Framework.googlecode.com>

Bibliography

Wishnu Prasetya is a researcher at Utrecht University. In the past he has worked in the area of verification of distributed algorithms and in syntax driven verification. Nowadays his research is focused more in software testing. He is the main author of the automated testing tool T2. Assisted with master students he is doing various projects and experiments around T2.

Tanja Vos is a researcher at the Universidad Politecnica de Valencia. Her research areas are evolutionary software testing and test evaluation.

A CHECK ON THE TESTABILITY OF REQUIREMENTS AND DESIGNS AND PRESERVING REVIEW INFORMATION

JEF BERGSMA

BABYLON-DT

In over 50% of ICT projects, development has started before test professionals get a look at the (test)documents. These documents have been finalized, and questions and suggestions about measurability will result in test cases (January 2009, Review among test professionals). When an automated review can simply, quickly and completely check a document for ambiguity, why not do this at the front end of a project? Make sure that words you use can only be understood in one way (unambiguous), mark the risks created by what cannot be made measurable yet and document what is done with the review remarks. By doing this documentation test, many test cases can be solved before the first functionality is programmed. Solving test issues will only take a couple of minutes, instead of many hours of project budget (Boehm's Law).

Having the possibility to preserve information about the ambiguity check and the actions afterwards, we have also found a solution to prevent time-consuming discussions about what is meant by certain words, phrases and/or requirements: write it down alongside the actual text of the document. Give definitions to often used words, comment on a decision that has been made, and preserve earlier remarks and your answer to it. In other words, keep track of all the valuable information made available on the way.

Successes and problems: In the spring of 2008 Babylon-dt started with putting theory into practice and commissioned the development of a Word plug-in, the documentation test. This plug-in is able to search for ambiguous words in a text, based on information in a database. This practical solution was successful in that customers got a very quick and deep insight into the quality of their documents.

Problems were that customers had to send their document to Baby-

lon-dt to have them tested, all the findings were presented at once, information about the handling of findings was lost, no possibility to put issues on a 'waiting list', and a high recall/low precision on the actual findings.

In the beginning of 2009 a successor was commissioned, dt-42. It supports and facilitates the review process, including findings management, and enables an automated Ambiguity Risk Analysis. dt-42 has convenient options for showing the Risk Indications, can be accessed via the Internet, has an Open-Risk Log and has a lower recall and higher precision. Problems are mainly within the area of using context during the analysis in order to get perfect balance between recall and precision.

The University of Tilburg has done a research project (under supervision of Babylon-dt) that looked into the feasibility of doing an automated ambiguity with the help of context analysis. The result said: "Our expectation is that detecting ambiguity in requirements specifications [test documents] has a bright future and will be used worldwide in ten years from now."

On the intersection between designers, reviewers, change management, test management and the customer, Babylon-dt has put together a unique application that enables problem prevention and minimizes the time-consuming process of problem solving. Our business combines process support and computational linguistics.

Bibliography

Jef Bergsma has been working in ICT for 21 years. The last 11 years have been dedicated to the area of Testing. As a Principal Consultant he has advised and coached many clients during test related issues. In 2006, he co-operated in establishing a testing company. He is committed to the research of automated solutions for language and text interpretation aimed at recognizing ambiguity, in cooperation with national and international universities.

DO SERVICES REQUIRE ONLINE TESTING? -A CASE STUDY-

MICHAELA GREILER, HANS-GERHARD GROSS AND ARIE VAN DEURSEN

SOFTWARE ENGINEERING RESEARCH GROUP
DELFT UNIVERSITY OF TECHNOLOGY

Business critical software has to be continuously available. As a consequence, software evolution tasks are performed online, while the system is operational. In our work we focus on how the state, including the configuration of a system, can influence the system's behavior during reconfiguration, and cause failures in the production system, even if the software has been tested.

Systems of interest are distributed and dynamic systems-of-systems, like service-oriented architectures (SOAs). SOAs bear testing challenges, like stakeholder separation, limiting the control of the system, and dynamic composition of services at runtime, hindering to test a priori [3,5].

In literature, many approaches for SOA testing can be found [1,4]. But, how state information influences test effectiveness has not been addressed so far. In our context, state comprises information about previous executions, the concrete set of installed and active programs, as well as history of preceding configuration activities. Our research correlates to the hypothesis, that testing in separated test environments, cannot reveal such state-based errors, because the test environments do not reflect the production environments adequately. Therefore we propose online testing to detect state-based faults in service-oriented systems.

Case Study. We developed an online testing method for built-in testing, providing test isolation, and implemented it in a vessel tracking and surveillance system. We present a case study evaluating the ability of our method to detect runtime configuration faults according to the SOA fault taxonomy by Bruning et al. [2].

Monitoring functionality has been added, representing a typical software update scenario, to gain a first insight in state-based faults. Even

though the test environment was set-up carefully, faults based on the current state of the production system could not be detected beforehand. Artificially determined properties with clean initial system states aggravated testing.

In our case study, faults of all five fault classes, publishing, discovery, binding, composition, and execution faults, could be observed. For example, often “wrong wiring errors” occurred in the online system, after updating a service, or changing a service’s state, because old export packages became unavailable or configuration changed. Very often, export packages were present in the testing environment, but were missing in the production environment, and the other way round. This caused malfunctions of services, unresolved dependencies and class cast exceptions. The results corroborate our hypothesis that some faults favor online testing as a more efficient detection technique.

In future research we want to investigate further which typical state and configuration data cause faults during online evolution. In a SOA laboratory, state information influencing the systems’ behavior will be examined. Based on the result, we will establish a fault taxonomy and enhance our online testing method to identify these faults.

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Bibliography

Michaela Greiler studied Computer Science at the University of Klagenfurt. In 2007, she studied at the University of Westminster in London and finished her studies in March 2008 with distinction. Currently, she is enrolled as a PhD-student at the Technical University of Delft. She works in the ARTOSC project on runtime testability of service-oriented architectures, in partnership with Logica. Her work is supervised by Prof. Arie van Deursen and Dr. Hans-Gerhard Gross.

TESTING IN THE MEDICAL WORLD

-PRACTICAL EXPERIENCES WITH THE FDA-

PATRICK DUISTERS

IMPROVE QUALITY SERVICES

When selling medical equipment on the US market a manufacturer must comply with the requirements of regulatory bodies, like the US Food and Drug Administration (FDA). These requirements apply to the product (such as safety), But they also apply to the product development and creation process, so also for the way of testing. To qualify for 'equipment manufacturer' authorized to (continue to) sell the product(s) on the US market one has to demonstrate that regulatory requirements are met. To verify qualification, the FDA regularly performs audits at the manufacturers' sites.

At a manufacturer of medical imaging systems a team of over 50 professional testers is responsible for integration, verification, validation and release activities during development of these systems. Software in these systems is still growing and now already contains millions of lines of code. Recently the FDA visited this manufacturer and my experiences during the audit will be shared with you.

This presentation will address requirements of the FDA for the production and testing process. These types of regulatory requirements raise questions like: Are we testing for quality or for the authorities? What are the consequences for a tester working in a controlled environment such as the medical industry? Examples of this are traceability, and logging of test results.

As disqualification might result in closure of the market, preparation for the audit is essential and will be addressed: do the processes comply and how to demonstrate that the processes are followed. Adequate and conclusive evidence is essential, such as proof that testing was performed according to the defined test strategy and that the appropriate test design techniques have been applied correctly and by qualified testers. Can product quality and mitigation of product risks, such as

safety, be proofed adequately? To provide the necessary proof a defined and mature test process is essential. Risk Based Testing (based on the PRISMA methodology) and TMMi have proven to be a good basis.

This presentation will also focus on the execution of the audit by the FDA: which kind of questions do they ask, what do they look for and how does the organization react on that? The correct information for example has to be presented on time and in the right way.

What are the consequences if requirements are not met and how is the follow up monitored?

Obviously there are lessons learned: for example organizing a mock audit to prepare for a regulatory audit. And how to improve the testing process?

It is expected that in the near future in other industries the impact of regulations will be increasing and that is why in this presentation the FDA serves a model for a regulating body influencing your testing process.

Bibliography

Patrick Duisters is working for more than 10 years within quality assurance and software testing in the ICT-industry. Patrick has extensive experience in the area of software testing, both in the administrative, financial, technical and governmental sector. In recent years, as test consultant of Improve Quality Services, he has been working as a (test) process manager and validation manager in the medical industry and for the Dutch government. He was directly involved in the preparation and execution of an FDA audit.

Before that he worked as test consultant and test coordinator for an insurance company, and has had a variety of assignments as test consultant for a large ICT service provider. Patrick is ISEB Practitioner in Software Testing, TMap Next, Prince2 and IREB certified. He is an accredited ISTQB trainer, and TMMi assessor. Patrick teaches courses such as ISTQB Foundation, TMap Next Foundation, Test techniques, and Reviews & inspections.

CHEAPER LOAD TESTING USING FEWER SIMULATED USERS

PIM KARS

ORDINA ICT

We present a theory that allows to reduce the number of simulated users (also known as Vusers) during a load test.

Reducing the number of Vusers saves both time and money, because simulating fewer Vusers than users results in

- Shorter ramp-up and ramp-down periods, thus reducing the overall test time.
- Less resource consumption (e.g. memory, network connections) on the load generators. This means a test can be run on simpler and often fewer load generators.
- Less license fees when a commercial load generation tool is used. The price of a commercial load generator increases with the number of Vusers.

Example:

An order entry system has 1000 users where each user enters an order once every hour on average. Suppose it only takes 12 minutes to enter an order. If each user is simulated by one Vuser, each Vuser will be idle 80% of the time. Allowing one Vuser to simulate more than one user is much more efficient. For example, using 500 Vusers, where each Vuser handles two orders every hour.

This ensures that the average simulated load level equals the average real load level. However, the variation in the simulated load level might be smaller than the real variation! With 1000 users, there is a (small) chance that 501 users concurrently enter orders; with 500 Vusers this chance is 0. Our mission is then to

- determine the distribution function for the concurrency level, and
- calculate the minimum reduction factor that preserves 'enough' variation in the concurrency level.

Let N denote the number of users, A the duration a user is active within I , the duration of one iteration of the business process. $p = A/I$ denotes the probability that a user is active. In the example $N = 1000$, $A = 12$ min, $I = 60$ min, and $p = 0.2$. Let C denote the probability density of the concurrency level, i.e. $C(k)$ is the probability that k out of N users are active. Assuming that a user starts a new iteration randomly inside each iteration period, $C(k)$ is a binomial distribution with parameters N and p . The average equals $N * p$ and the square of the standard deviation equals $N * p * (1-p)$.

We use primes to denote the values of N etc. for the V users. The reduction factor $f = N'/N$, where $0 < f \leq 1$. To preserve the average concurrency level, we need $I' = I * f$ and $p' = p/f$. Unfortunately, this implies that the standard deviation is also reduced. To preserve as much as possible of the standard deviation, we require that the reduction in standard deviation is not less than a prescribed factor. In the presentation we show the steps to find the minimal f that guarantees this. For the example, setting the level to 90% results in $N' = 569$.

Considerable savings may result from this approach. In one particular customer case we reduced 507 users to 51 V users, a reduction of almost 10%!

Bibliography

Pim Kars works as a senior consultant at Ordina ICT B.V. in the Software Performance Engineering group. His field of interest is the performance of software (testing, modelling, analysis). He holds a Ph.D. in computer science from the University of Twente. He can be reached at pim.kars@ordina.nl.

THINGS TO CONSIDER BEFORE APPLYING TTCN-3

-THERE ARE TWO SIDES TO THE COIN-

ERIK ALTENA

SQS-GROUP

TTCN-3 has long been hailed as the silver bullet for software test automation. An industry standard with many strong points. It is a vendor independent language specific for testing, it has multiple ways to be presented and an automation framework that supports each and any interface imaginable, even for concurrent testing. So why isn't everyone who is in test automation into TTCN-3?

TTCN was founded in 1984 to describe conformance tests for communication standards. It allowed skilled engineers to describe the logic of their tests in a technical language independent from a specific programming language. The European Telecommunications Standards Institute (ETSI) adopted TTCN-3 and along with a history of 25 years it is now the industry standard for software testing within the network and telecommunications domain. But the usage of TTCN-3 goes beyond telecoms, as shown in Table 1.

The application area's of TTCN-3 can be deduced from its main characteristics. Looking at the diverse applications of TTCN-3 common characteristics can be distilled. Immediately striking is that its application almost always implies the testing of industry-specific widely-used standardised communication protocols, e.g. GSM, 3GPP, IPv6, AutoSAR, etc. Furthermore, its biggest success stories involve the integration testing of multiple devices, preferably with multi-supplier relationships around that standardised protocol. This matches the message oriented language and the conformance aspect embedded in the standard since 1984. Then again, these and other characteristics could also be beneficial for a lot of other area's as well. This was demonstrated in the award-winning European research project TT-Medal and presented at the Dutch Testing Days 2005.

When applying TTCN-3 to new domains technical, educational and

financial drawbacks can be noticed. The test language is primarily message oriented and makes file-based communication or database verifications hard to describe. Furthermore, the test language is like a programming language, which makes it hard to be adopted by less technically skilled testers. When trying to apply TTCN-3 and these issues are overcome, an adapter will be needed to enable the TTCN-3 tool to communicate with the interface under test.

The return-on-investment (ROI) within a project is therefore likely to be crushed by the start-up costs of a test tool, the development of one or more adapters and the subsequent training. But when applied on a broader level ROI's are much more likely as one tool can replace the multiple test tools present within an organization. This will cause a large efficiency increase in test tool usage and utilization of test automation experts, comparable with the centralized load & performance testing seen nowadays.

Additionally in order to widen the usage of TTCN-3 its specification capabilities should widen too. File, database and GUI interaction should be supported. Meanwhile the complexity to use the tools available should be reduced. All in all this would prove to be a difficult task to accomplish with the existing strong user base of TTCN-3.

| <i>Domain</i> | <i>Market share</i> |
|---------------|---------------------|
| Telecoms | 70% |
| Automotive | 15% |
| Embedded | 10% |
| Other | 5% |

Table 1: Relative TTCN-3 market share per domain (based on tool vendor inquiry)

Bibliography

As head of a TTCN-3 competence centre Erik has practical experience in introducing TTCN-3 into new areas. He participated in the European award-winning research project TT-Medal which widened TTCN-3 usage. When working with TTCN-3 Erik cooperated closely with Jos van Rooyen (Bartosz ICT), whom he consulted when writing this abstract. Jos and Erik are composing an article which will elaborate this abstract.

Erik Altena is senior consultant at SQS Nederland. He presents regularly at national and international events. As a quality manager he helps organizations to improve their software quality and monitors this as test manager within programs and projects.

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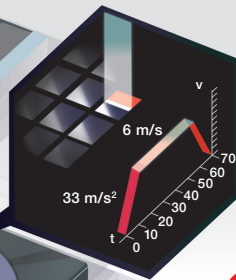
Morgen kunnen we sneller chips maken. Vandaag mag jij ons vertellen hoe.

De race om steeds meer IC-schakelingen op de vierkante centimeter te realiseren, is niet de enige race in de chipwereld. Fabrikanten willen ook de chipproductie zélf versnellen. Maar hoe voer je een machine op, die op de nanometer nauwkeurig moet presteren?

In de chip-lithografie-systemen waar ASML nu aan werkt, wordt een schijf fotogevoelig silicium (de wafer) op hoge snelheid belicht.

De wafer ligt op de zogenoemde waferstage (ruim 35 kilo). Die beweegt onder het licht door. Heen en weer, dus met een extreme versnelling en vertraging van 33 m/s^2 .

Deep UV-licht (193 nm)



Chips met 45-nm-details kun je alleen maken als je - tussen versnelling en vertraging door - op de nanometer exact belicht. 1000 sensoren en 8000 actuatoren bedwingen en daarmee 180 wafers per uur belichten. Hoeveel software en processoren vraagt dat? En hoe manage je de architectuur daarvan?

Versnellen met 33 m/s^2 is al een uitdaging op zich. Welke motoren kies je? Waar vind je versterkers met 100 kW vermogen, 120 dB SNR en 10 kHz BW? En dan begint het pas. Want voorkom maar 'ns dat al die warmte je systeem weer onnauwkeurig maakt...

Voor engineers die vooruitdenken

Profiel: Wereldwijd marktleider in chip-lithografie-systemen | Marktaandeel: 65% | R&D-budget: 500 miljoen euro | Kansen voor: Fysici, Chemici, Software Engineers, Elektrotechnici, Mechatronici en Werktuigbouwkundigen | Ontdek: ASML.com/careers

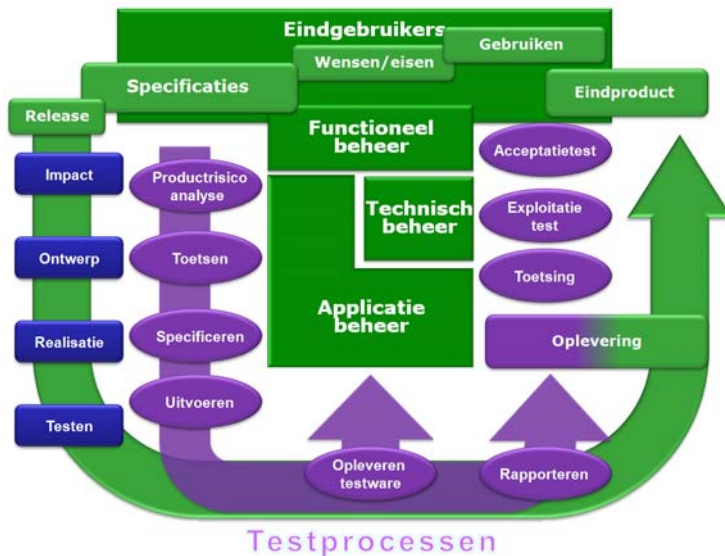


ASML

Life Cycle Testing

Testen is de kritieke succesfactor voor applicatieonderhoud en –beheer

Wilt u ook meer inzicht in de kwaliteit van het testproces? De Life Cycle Test Scan helpt u daarbij!



Effectiever testen door integrale benadering van beheerprocessen

Meer weten? Kijk op: www.lifecycletesting.nl of kom naar onze stand.

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4 Nov 2009, Eindhoven, NL**



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Our partners





The primary mission of information technology is to improve business processes and increase profits. Companies are constantly rethinking and struggling with how to use IT to a competitive advantage, reduce IT operating and maintenance costs, and reduce the total cost of ownership. All while attempting to deliver increased value... Most of these challenges can be traced to the same source: the struggle to ensure that a constantly changing IT environment continues to do what it has to do - without incurring unreasonable costs.

To control and reduce cost, increase reliability and ensure continuity Parasoft offer solutions (off-the-shelf tools and professional services) to automatically test embedded software, e-business platforms, websites, web-services and back-end systems.

By choosing Parasoft's regression test solutions you will work with:

- **A strong, focused and local supplier:** Parasoft is a 1986 founded, US based Software Company with 300+ employees inventing, developing and marketing automated testing solutions. Parasoft has global coverage with offices in Asia, Europe and United States.
- **Proven technology and services:** Parasoft's regression test solutions are used by more than 10.000 users in fortune-500 companies facing cost-saving, reliability and time-to-market challenges with increasingly complex software systems and IT environments.
- **Increased productivity, quality and reduced costs:** The Parasoft solution will automate the manual testing of your applications and help to increase productivity, quality and reduce cost. Several Case studies underwrite this.

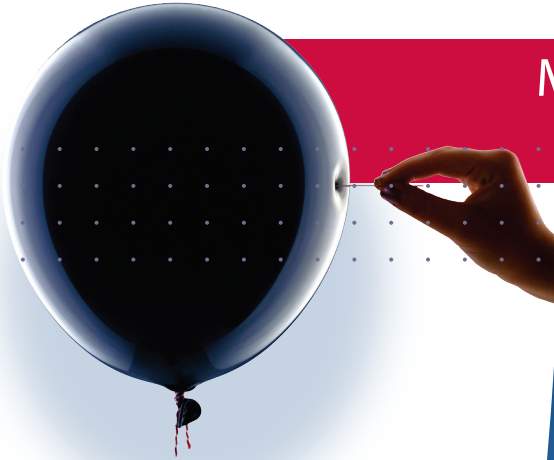
The Dutch Ministry of Interior claims: *"The work changed from manual labor to the development of interesting test cases. A lot of manual labor disappeared and was outmoded. This enabled us to speed up the development cycle. We could now generate a release every three days instead of every three weeks."*

Lufthansa Cargo claims: *"The Parasoft solution was a critical success factor for the overall project. After seeing the excellent results of the project, I strongly believe that it would not have been possible to accomplish this level of high quality without Parasoft."*

Contact in the Netherlands:

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Telefax: +31-70-3920074
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QUALITYHOUSE

Sometimes a company's name is telling. In this case Qualityhouse BV is telling as well.

The company is committed to continuous quality improvement and process enhancement in the ICT sector. Following experience oriented business approach, Qualityhouse is a frequently asked partner in the Netherlands for testing and monitoring software and software related processes.



Today we serve the top 200 enterprises of the Netherlands. Banks, insurance companies, telecommunication enterprises, transport and logistics providers as well as services and regional and central government departments entrust their software to Qualityhouse.

Testing, improvement and training

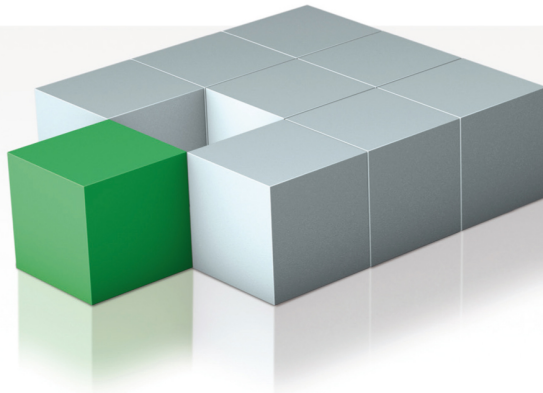
The Dutch software expert focuses on three core fields. These are software testing, process improvement, and training and education. "Our business is not about selling a product," "We deliver knowledge, cognition and capacity in the fields of software testing and quality provision. We help our clients to choose software of better quality with less bugs and a low degree of maintenance and implementation cost."

Using the TMap® method, Qualityhouse conducts tests in all phases of the production of software, beginning with the functional design. "In addition to our experience we distinguish ourselves through our highly educated employees," "Training and continuous education is at the top of our agenda and we also pass on our experience to our customers. If required we train their personnel on site, as well."

Investment in people

Qualityhouse still focuses on the domestic market. In the Netherlands, Qualityhouse is an independent testing company. In order to enhance its international marketing, Qualityhouse regularly exhibits at the Eurostar. Qualityhouse is also focusing on the improvement of the test process.

November 2007 Mart Smeets presented our book about our V2M2 test process improve model. Of course our people are central to everything we do. Therefore we will continue to invest much in trainings and further education. We are going to consolidate our team and in order to expand our activities we also will try to get in touch with young people from schools and interest them in our business". As the market for software testing is still good, we have cause to be optimistic about the future.



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SQS is:

- De grootste onafhankelijke partij op het gebied van integrale Kwaliteitszorg* in Europa!
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Wil je meer van ons weten? Kom naar onze stand of neem contact met ons op via 088 655 8880 of info@sqs-group.nl - we vertellen graag meer!

* Integrale Kwaliteitszorg omvat een breed dienstenpakket rondom Requirementsengineering, Testen, QA, Procesverbetering en Software Change en Configuratie Management.

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SQUERIST



Aangenaam!

Wij zijn Squerist. Een snelgroeiende organisatie die diensten biedt rondom bedrijfsprocessen en ICT. Zo houden we ons dagelijks bezig met testen, functioneel beheer en procesoptimalisatie. Sinds 2001 zijn we actief op basis van detachering, in projectvorm of door middel van uitbesteding.

We ontmoeten u graag op de Nederlandse Testdag. Om kennis te maken en ideeën op te doen. Maar ook om samen te sparren over diverse testgerelateerde onderwerpen. En om u alles te vertellen over onze testautomatiseringsoplossing TASQ.

Maak kennis met **TASQ1.0!**



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Met Test Value is testen voor u één zorg minder.



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IN CONTROL WITH SMART TESTING

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Valori Testing is the independent provider of testing and quality services. With an almost 19 year track record in supporting excellence, by making the most from your IT investments.



Our SmarTEST approach (www.smartest.nl) has proven its effectiveness in the real world. It combines approved standards and best practices with a smart application of modern tools and methodologies.

Valori offers a complete range of test services. From high quality staffing to Managed Services. No matter whether your main challenge is in Outsourcing, Package Selection & Implementation, System Integration or Customized Software. Our customers are financial, staffing, telecom, government and public utility organisations, mainly in the Netherlands.

Valori's 150 consultants combine IT and business knowledge with outstanding communication skills.

As organiser of the Dutch Testing Day 2008, Valori is very pleased to be meet you. Please don't forget to have a word with us at the Valori stand!

VALORI

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