

Success Story

“Enosis adopts risk-based, requirements-driven testing approach to offer functional testing services for graphics library”



Background

The client continually develops and enhances a library providing geometry and graphical functions to satisfy the incessant requirements of their market leading engineering applications. The major concerns were bug fixes, conducting reviews of algorithms for verification of their appropriateness, impact analysis, validation of API to ensure integration of the library, formulating knowledge on different functions including Shape, Texture and Transform etc. By using superior engineering skills, proven tools & techniques and a high process oriented approach Enosis provided a structured solution to all these problems and proved itself as an ideal QA and testing partner for the client.



The Client

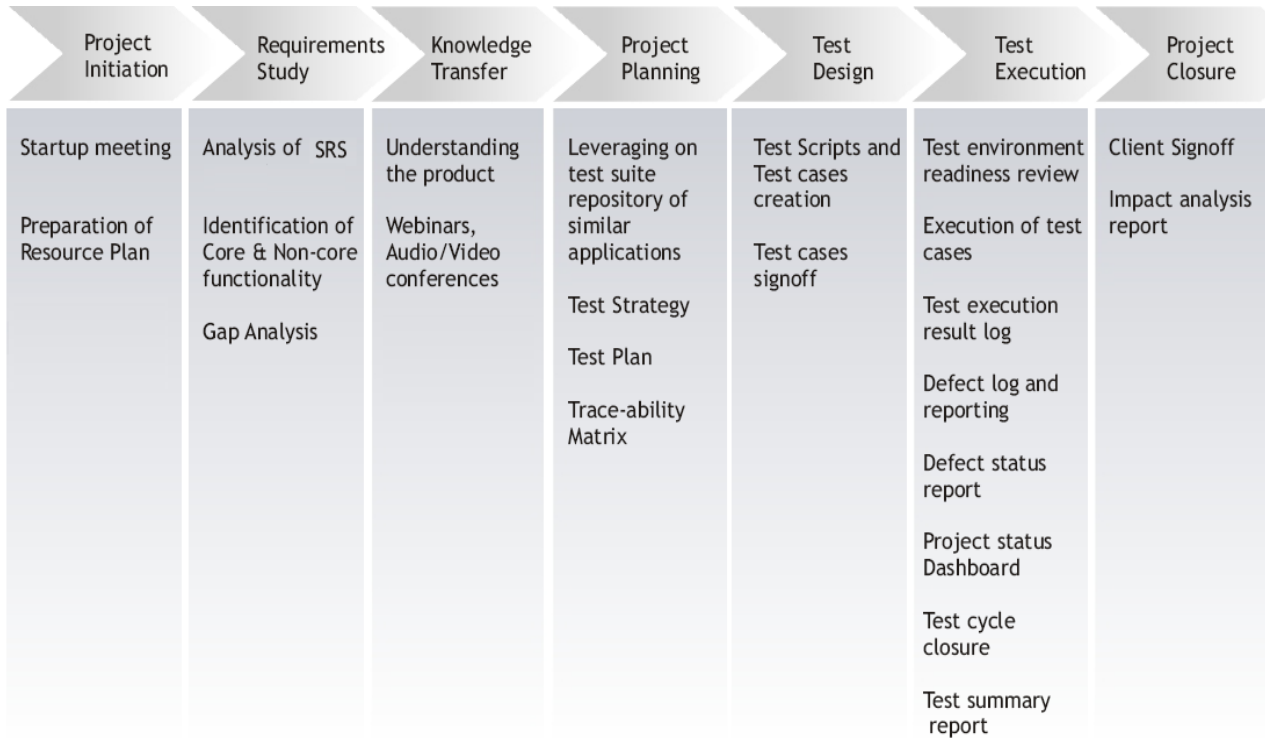
A world leader and pioneer of developing engineering simulation software used to predict how product designs will operate and how manufacturing processes will behave in real-world environments. They are developing software to solve the most challenging engineering problems allowing engineers to refine and validate designs at a stage where the cost of making changes is minimal. Their simulation solutions are deployed across automotive, aerospace, defense, electronics, marine and shipbuilding industries serving engineers and researchers in corporations that include Airbus Industries, Air Force Research Lab, Bell Helicopter, Boeing, Rolls-Royce, John Deere, Hitachi, LG Electronics, Lockheed Martin, NASA, Toshiba Corporation, US Navy, GE, Hitachi, Toyota, Honda, BMW and Ford.

CHALLENGES:

- Identification and understanding of application functions, extracting technical implementation details and analysis of the approach followed to implement the features, bug fixes in details
- Choosing the right algorithm and development approach after the software requirements are finalized
- Properly conducting the reviews of selected algorithms for verifying and validating their appropriateness
- Ensuring the exhaustiveness of the algorithm studies, impact analysis, effectiveness of trade-off studies in the development phase
- Domain-specific requirements and Application Programming Interfaces (API) are required to be validated to ensure the integrity of the library. Today, requirements analysis is time-intensive and expensive because it is done manually. Major commercial tools are neither powerful nor customizable enough to verify complicated API rules. This necessitates intuitive approach for verifying domain-specific requirements
- Nucleus requires domain and behavioral knowledge on OpenGL functions and features like lighting, various shading, orientation, and various types of zoom, orthographic and perspective view and their effects on various models which are comprised of different 3D shapes
- Formulating knowledge on different functions including Shape, Texture and Transform. Nucleus defines the parameters of OpenGL and has pointers to the structures which manage the Scene, Camera, Spectrum, Selection, global parameters and actions like animation. Enosis SQA team needed to acquire comprehensive understanding of the application workflow and functionalities to test the features for assuring the quality
- Development of plug-in applications that communicate with the software framework. Writing test codes to invoke the Nucleus APIs in congruence with contexts
- Verifications of memory usage to ensure that it doesn't take up memory at runtime without resource de-allocation afterwards to avoid memory leakage which makes the system lethargic
- Modification of a single function in the Nucleus library may affect the behavior of other features. After major enhancements or modifications, a large number of testing tasks have to be executed within a limited timeframe while consistently maintaining quality and ensuring that the developed solution performs seamlessly across different platforms
- Bug-fixes are verified with different dummy models and geometric shapes to find out shading, lighting problems and ascertain the compatibility of the solution
- The challenges of functional testing can be associated with their contextual dependencies. Although the traditional practices of code being

“thrown over the wall” to the SQA team is prevalent, the validation team members have to encumber the responsibility of exploring and determining the contextual dependencies of different functions.

- Traceability is established between mission, software and non-functional requirements
- Representation of requirements information in



Functional Testing Process

THE SOLUTION

With a successful track record in executing challenging engagements through superior engineering skills, proven tools & techniques and a high process oriented approach, Enosis emerged as an ideal QA and testing partner to the client.

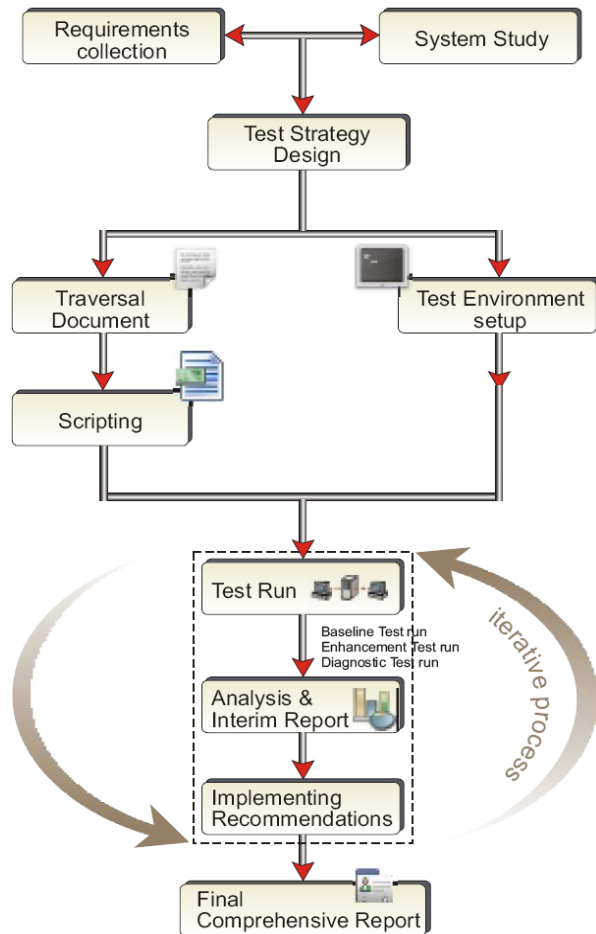
Our test experts assume a proactive role by ensuring:

- The non-functional requirements such as quality attributes, performance goals, constraints, external interface requirements etc have been explicitly specified and documented

either or both the alternate ways (structured text or graphical format) and establish consistency between the two representations

- Use of very good engineering talents so that the team working for the client was quickly able to identify application functions, extract technical implementation details and acquire adequate domain and behavioral knowledge
- Device tests that would validate the design of various algorithms using their prototype implementations

- Verification and Validation of complex library so that maximum system is available at all times. Due to the ever increasing complexity of nucleus, we adopted process driven testing methodologies, proven tools and technologies for delivering desired work product
- Utilization of in-house tools, to monitor memory status for running the Nucleus library after substantial enhancements and modifications have been incorporated



Product Testing Lifecycle

- Enhanced future test efficiency by evaluation of test effort required for testing of fixes performed by application developers and by maintaining test history for reusability in similar situations

- Pilot test execution and management to help fix or create new, repeatable test processes and manage testing practices, with a deep focus on validating business solutions, rather than simply testing software

THE BENEFITS

- Test scenario creation and test case creation, both positive and negative, provided nearly 100% test coverage.
- Enosis developed a customized testing framework to simplify the testing process which saved significant time and resources.
- SQA Methodology was hauled and significant process improvements were set in place.
- Enosis consistently met key objectives of the engagement, thus helping the client to deliver its products on time, every time
- Knowledge Transfer was made easy as Enosis employs the best engineering talents and follows a process oriented approach that includes webinars, audio/video conferences
- Complete transparency was ensured by sending defect reports to the client on a weekly basis
- Established credibility and ensured customer satisfaction by facilitating significant decline in production issues and number of complaints from the end-customers
- Reduced cycle time for validating issues, product releases, fixes – at least by 60%. Faster technical acceptance tests for end customers due to increased per-day effort towards deliverable completion

TOOLS AND TECHNOLOGIES

Programming Language: C, C ++, MFC, Open GL

Platform: Win XP 32/64, Vista, Linux 32/64

Tools: Valgrind, In house tools for memory and performance measurement