



THG PROVIDES EXPERT ANALYSIS OF APPLICATION LEVERAGED BY IT DIVISION OF NORTHROP GRUMMAN

Expert Application Review Services

“The recommendations of this assessment provided insights and practical considerations that empowered the IT principals at the client to now consider leveraging the strengths of Northrop’s Electronic Assessment application, instead of focusing on addressing its shortcomings.”

— James Casas, Principal Consultant/Project Lead, The Henson Group

Microsoft Gold Certified Partner The Henson Group, Inc. provided an expert-level review of a unique “Electronic Assessment” environment, based on .NET technologies, for the IT division of client Northrop Grumman Corp.

BUSINESS SITUATION

Northrop Grumman Corp. is a \$30 billion global defense and technology company who’s 120,000 employees provide innovative systems, products, and solutions in information and services, electronics, aerospace and shipbuilding to government and commercial customers worldwide.

For more than 50 years, Northrop Grumman Information Technology has helped define the future for government and businesses. Today, its trusted solutions serve all branches of the US Armed Forces, federal civilian agencies, the national intelligence community, state and local government, and commercial and international clients.

Northrop Grumman IT furnishes its federal, state and local, and commercial customers with a wide range of IT services. Its offerings include managed IT services, network design, asset management, infrastructure management, systems integration and modernization, data center management, hardware and software maintenance, and help desk support. Commercial customers include Fortune 500 companies, IT outsourcing providers, original equipment manufacturers, integrators, and resellers.

(For more information on this THG client, please visit its website [http://www.it.northropgrumman.com/.](http://www.it.northropgrumman.com/))

ABOUT “ELECTRONIC ASSESSMENT”

Northrop Grumman IT developed technology it called Electronic Assessment (e.Assessment) to serve as a total solutions assessment system that provides the flexibility to perform diagnostic assessments, both formative and summative, on a schedule that teachers and schools establish. It incorporates best practices in education to properly assess student knowledge in key areas.

“Northrop Grumman works with local government on many projects, including

Overview

Country or Region:

United States

Industry: Education

Business Situation

Realizing there were inherent challenges with its e.Assessment application, Northrop Grumman IT retained THG to provide Discovery Findings and Application Performance Recommendations following a review of the client’s unique environment.

Solution

As designed by The Henson Group, the actual assessment consisted of three phases (Discovery, Assessment, and Recommendations), and was intended to be part of a larger project consisting of subsequent certification, auditing, and management phases.

Results & Benefits

The Henson Group successfully achieved the client’s objectives. By selecting only a subset of the recommendations listed above and applying them, QA testing showed the following promising results, producing a positive increase in overall performance.



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assisting public schools and providing educators with better technology tools,” says James Casas, Principal Consultant, Project Lead, The Henson Group.

“Currently, e.Assessment has been developed for Virginia Fairfax County, but once Fairfax County goes through full adoption, Northrop Grumman will plan to market this system to the entirety of Virginia state and then to other states,” Casas adds. “This effort is part of the ‘No child left behind act.’ Though, as different states have different laws and criteria, additional work will have to be done on e.Assessment so that it can be adopted by other states.”

(For more information on e.Assessment, please access the Northrop Grumman Case Study:

“NG Partners With Fairfax County Public Schools for E.Assessment System” <http://www.it.northropgrumman.com/pressroom/press/2006/pr36.html>).

Specifically, e.Assessment is primarily a web-based electronic student assessment application, developed to provide educators with an automated tool that delivers data-driven results to help students meet or exceed State-mandated learning standards in Virginia.

e.Assessment provides a process-oriented, total assessment solution focused on teacher collaboration and aligned with the concepts of Professional Learning Communities. It provides teachers with specific research-based strategies to improve student learning.

e.Assessment allows students to easily view and take tests designed to evaluate key knowledge points, as well as access the assessment results. Students can view explanations provided by teachers for each question. Teachers and students receive immediate feedback on standards mastered or where remediation may be needed.

e.Assessment follows a student’s record of progress, including state standards that the student has mastered, pacing, the latest performance predictors of success or failure, and identification of academically at-risk students.

e.Assessment was developed by Northrop Grumman IT in collaboration with Fairfax County Public Schools (FCPS) and other experts in the education industry to proactively manage student performance and improve achievement throughout the school year.

e.Assessment includes security measures to ensure the integrity of the system. For example, users are able to view their own e.Assessment profile, but not modify the profile. Additionally, all access activity performed in the e.Assessment solution is logged and can be accessed through various reports by the e.Assessment IT Administrator.

In addition, e.Assessment provides functionality for five user roles:

1. Students
2. Teachers
3. IT Administrators
4. Principals or School Leaders
5. School Administrators

Focus For Review & Remediation

“This became problematic, as when larger school districts are expected to come online in the future, there could potentially be thousands of students online at any one time during normal school hours.”

Through Northrop Grumman IT’s Software Quality Assurance (QA) testing, based on the existing architecture, it was ascertained that e.Assessment began to perform poorly when approximately 350 users were actively online.

“This became problematic, as when larger school districts are expected to come online in the future, there could potentially be thousands of students online at any one time during normal school hours,” Casas says.

Realizing there were inherent challenges with the e.Assessment application, Northrop Grumman IT proactively approached Microsoft Gold Certified Partner The Henson Group, Inc. (“THG”), to provide Discovery Findings and Application Performance Recommendations following a review of the client’s unique e.Assessment environment based on .NET technologies.

As The Henson Group is a Microsoft Gold Certified Partner with extensive experience in Web Site architecture and development, The Henson Group engaged Northrop Grumman IT to provide a “Web Site High Availability and Performance Review” to provide the client with a thorough assessment with which to identify and address issues, including recommendations for remediation.

The Henson Group subsequently designed a review process that incorporated the information supplied by Northrop Grumman IT, the on-site observations of THG Principal Consultant James Casas, and the latest information available from Microsoft pertaining to innovations in Web Site application development technology.

Northrop Grumman IT’s professionals were engaged and encouraged to request documentation to meet their informational needs, both during the project and for the future.

The Henson Group was ideally suited for such an engagement, as it offers a dedicated Application Development Practice staffed by Microsoft Certified Application Developers (MCAD) many former Microsoft employees, led by Mr. Casas. This practice specializes in Custom Development, Code Migration, Data and Application Interoperability, Web Services, and more.

As Microsoft 2007 Partner of the Year, The Henson Group is a "Gold Certified Partner" founded by former Microsoft engineers in 2002 specializing in enterprise deployments and .NET development of Microsoft products that overcome today’s business challenges.

The preferred solution provider for many US and international corporations, The Henson Group leverages direct ties to the Microsoft product groups, is a preferred sub-contractor of Microsoft Consulting Services, holds a seat on the national Microsoft Partner Advisory Council, and is recognized among the top US consultancies in Microsoft’s partner community (Microsoft’s "Solution Finder").

The Henson Group also achieved Microsoft’s Official Custom Development Competency by demonstrating expert-level abilities, maintaining a roster of Microsoft Certified Consultants with applicable experience, and producing numerous client references to objectively testify to our abilities.

“The overall objective of this project was to provide recommendations designed to improve and enhance the performance of the e.Assessment Internet application based on .NET technologies.”

What this meant for Northrop Grumman IT was that The Henson Group had the resources, project experience, and proven technical ability to achieve its objectives for this engagement.

SOLUTION

“The overall objective of this project was to provide recommendations designed to improve and enhance the performance of the e.Assessment Internet application based on .NET technologies,” Casas specifies.

As designed by The Henson Group, the actual assessment consisted of three phases (Discovery, Assessment, and Recommendations), and was intended to be part of a larger project consisting of subsequent certification, auditing, and management phases.

This project was the result of the critical assessment activities performed during the first phase. The actual deliverables consisted of the following:

Discovery

- Document the technologies that are used to support e.Assessment
- Review relevant documentation and diagrams
- Collect technical information from the production environments
- Interview/Discussions with e.Assessment administrators

Evaluation

- Analyze data collected in Phase 1

Recommendations

- Produce recommendations, including, but not limited to:
 - o e.Assessment technical recommendations, including the systems which comprise all three tiers – Front-end, Component Class, Middle-tier Web Services, and Data Source (Oracle 10.1)
 - o e.Assessment process recommendations to improve the efficiency of operations
- Meeting to review recommendations

Review Methodology Overview

To determine why and where performance issues existed, a Code Analysis was required to fully understand the functionality behind how Students and Teachers initiate common actions from all tiers (UI > Application > Database and back), the following user actions were carefully analyzed during this review process:

1. Student Role – from login, to test taking, to submission for grading, and finally logout

2. Teacher Role – from login, scoring, selecting specific student tests, viewing results, and finally logout

These actions were the same examined during QA testing of 100, 200, 300, and 350 users simultaneously hitting the e.Assessment web site.

Based on using the 350 user load test as an example, the load was broken down to 335 Students and 15 Teachers which follows a typical ratio of students to teachers who would be logged on to the web site at any given moment. The same ratio was kept for the other tests.

After a full code analysis was completed leveraging DevPartner Studio's add-in for Microsoft Visual Studio, a closer examination was done on the code paths taken during both user role actions (Student and Teacher).

Microsoft Visual Studio in Debug mode was used to follow these code paths and gain a better understanding of what the underlying code was actually doing.

As Northrop Grumman IT had a valid license for RedGate's ANTS Profiler for .NET, this tool was used to profile longer running web pages. This provided the ability to drill down and fully analyze the associated VB.NET code, logic, and SQL database that was emitted to be executed on Oracle on these slower pages. Because the e.Assessment database had already gone through rounds of normalization, more focus was placed on examining the dynamic SQL, communication, and round trips that the VB.NET code executed onto Oracle.

Additional steps were taken to examine all settings within Machine.Config, Web.Config, IIS6.0 Web Sites (Web and Application Servers), and Application Pool settings within IIS.

The Henson Group fully documented its discovery findings and recommendations and presented these materials to IT principals at Northrop Grumman IT.

RESULTS & BENEFITS

During the final days of the Performance Review process, The Henson Group worked with Northrop Grumman IT to implement a number of the recommendations detailed in this document, including:

- Splash page recommended fix - application variable and eliminated double-post back
- Login page recommended fix - made asynchronous
- eAssessTestContent page recommended fix - eliminated double-post back
- eAssessTestDisclosure page recommended fix - eliminated double-post back and ensured we retrieved all properties for test only one time
- Adjust machine config settings as recommended above

As designed by The Henson Group, the actual assessment consisted of three phases (Discovery, Assessment, and Recommendations), and was intended to be part of a larger project.

By selecting only a subset of the recommendations listed above and applying them, QA testing showed the following promising results, producing a positive increase in overall performance:

Total Hits: 189,015 (10.226 % increase)
Average Hits per Second: 42.831 (10.150% increase)

Transaction Name	Minimum	Average	Maximum
Click Continue2	0.06	1.616	57.779
Continue	0.006	0.255	51.287
Continue1	0.555	22.039	88.438
Level	0.124	1.447	25.017
Load	0.002	0.131	25.096
Login	0.157	5.724	64.871
Logout	0.026	0.948	54.488
Scores	0.089	2.483	36.471
Select Test	0.038	1.208	60.383
Subject Area	0.068	2.113	51.594
Take Test	0.369	18.125	76.627
View Results	8.165	23.486	88.436

Table 1 - QA Results (secs) for e.Assessment – Students and Teachers

With only a minimal number of recommendations applied, the results show an increase in both Total Hits (10.226% increase) and Average Hits per second (10.150% increase) resulting in more users being able to access the web site.

Focusing on wait times during this QA test compared to a previous QA test, the average wait time for “average” decreased by 11.135% and the average wait time for “maximum” decreased by 26.974%.

By taking a few simple steps, performance gains were realized. It was recommended that Northrop Grumman IT apply the **full set of** recommendations to further realize increases in performance.

The Henson Group achieved Northrop Grumman IT’s vision of not only offering a qualified assessment and visibility of the challenges it was experiencing, but practical recommendations for addressing several issues.

“The level of efficiency that we were able to project, based on recommendations, was not possible before,” Casas says. “By increasing the availability and reliability of key components of e.Assessment, we have provided students with a tool that will improve learning as a whole and make both educators and student better prepared for success in school and onward.”

As a result, students will have the ability to be more proactive on examining what areas they are not excelling in and will have instantaneous feedback from their teachers as to what they need help with.

By following the recommendations that THG has given, Northrop Grumman has been able to provide a more responsive system for educators and



students where both can obtain answers to problem-areas within seconds, rather than days.

This concluded the reporting for the e.Assessment Application Review & Recommendation project Microsoft Gold Certified Partner The Henson Group performed for client Northrop Grumman IT.

In summation, The Henson Group methodically examined key facets of the application, identified a variety of issues, and proposed remedies.

As the client moves towards remediation, it is important to understand that The Henson Group based its guidance on the information supplied by Northrop Grumman Information Technology, the on-site observations of THG Principal Consultant James Casas, and the latest information available from Microsoft pertaining to innovations in Web Site application development technology.

About The Henson Group

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