

Customer: United States Bureau of Economic Analysis

Web Site: www.bea.gov

Customer Size: Approximately 500 employees

Country or Region: United States

Industry: Government—National/Federal

Customer Profile

Based in Washington, D.C., the Bureau of Economic Analysis (BEA) promotes a better understanding of the U.S. economy by providing the most timely, relevant, and accurate economic accounts data.

Software and Services

- Microsoft Server Product Portfolio
 - Microsoft SQL Server 2005 Enterprise Edition
 - Windows Server 2003

Hardware

- Dell PowerEdge 2950 server computer with two dual-core processors

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www.microsoft.com/casestudies

Government Agency Speeds Calculation by 25 Times with Custom Database Solution

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Brian Callahan, Chief Information Officer, Bureau of Economic Analysis

The U.S. Bureau of Economic Analysis (BEA) needed a flexible system to calculate the gross domestic product (GDP) faster so that it could incorporate the latest data submissions from external sources while giving economists more time to analyze and validate results. BEA developed a solution using Microsoft® SQL Server® 2005 data management software, which makes it possible for the bureau to calculate GDP estimates 25 times faster.

Business Needs

Although a relatively small agency, the Bureau of Economic Analysis (BEA) produces some of the most closely watched economic statistics in the United States, including the gross domestic product (GDP). The GDP is the total output of goods and services produced in the country and is widely used by economists to gauge the health of the U.S. economy. Governments and businesses use analyses of the GDP to make significant decisions concerning employment, investments, acquisitions, and fiscal policies. The GDP has been ranked as one of the three most influential measures that affect U.S. financial markets.

For each quarter, BEA produces three GDP estimates: advance, preliminary, and final. Producing these estimates requires BEA to run complex calculations against terabytes of data. Importantly, these calculations need to meet strict timing requirements as release dates for GDP estimates are set far in advance and cannot be missed.

To keep up with the changes in the U.S. economy and to accommodate the most recently received and refined historical data, the bureau annually revises its GDP estimates for the previous three-year period. Also, once every five years, BEA benchmarks GDP data all the way back to 1929 to make appropriate adjustments.



"Producing GDP estimates is complicated work, with highly interdependent data points," says Carol Moylan, Chief of the National Income and Wealth Division at BEA. "Monthly, we deliver more than 300 tables of supporting data with each GDP estimate. The workflow is continuous as preparation for the next release begins immediately after publication of each estimate."

Using a custom-built application, it took BEA approximately one hour to produce a quarterly estimate and eight hours for a benchmark. Additionally, modifying GDP calculations to reflect shifts in the economy required a great deal of time and effort. "Consistency of results across changes in the economy was very difficult to achieve," says Steve Holliday, Chief of the Office of Application Development at BEA.

Solution

BEA realized that it needed a faster, more maintainable, and highly reliable database solution to meet the challenges of measuring a rapidly changing economy. The bureau considered database solutions from Sybase, Oracle, and Microsoft before deciding on Microsoft® SQL Server® 2005 Enterprise Edition data management software. "We chose SQL Server because it could handle all of the math, hierarchical relationships, time-based calculations, and nontrivial amount of data in a convenient and efficient manner," says Dr. David Rozenshtein, Principal Database Consultant to BEA. "SQL Server also fit well within BEA's current IT infrastructure."

Once BEA turned over the rewriting of the solution's kernel to Rozenshtein and his colleague, Sandip Mehta, it took the two consultants only one week to prove that the core calculations for the benchmark GDP could be produced in less than an hour. They completed the benchmark component in November 2008 and the quarterly component

in April 2009. BEA will use both in a final benchmark/quarterly GDP release in July 2009. "Much credit for the success of this project goes to the extremely capable and dedicated BEA business and development teams," says Mehta.

Unlike a traditional approach in which developers implement business functionality in a separate layer—written in Java, C++, or C#, for example—BEA and its consultants decided to implement all of the significant computations directly in the database layer using SQL Server. And instead of hard-coding the business logic into the programs, they expressed most of it in the metadata and kept the programs generic.

The effect of these two design decisions was dramatic. "By putting more than 90 percent of the solution's business functionality into the database layer, we achieved a ten-fold reduction in the size of the code base and a great improvement in its maintainability," says Rozenshtein. The solution runs on a Windows Server® 2003 Enterprise Edition (64-bit) operating system.

BEA also plans to use the solution to enhance its economists' research capabilities. "Due to our faster calculations and broader business intelligence capabilities, we now can easily explore 'what-if' scenarios by adjusting the structure of the data and the calculations to see how that affects our GDP estimates," says Moylan.

Benefits

BEA found that its new solution required little development time and provides greater reliability than its previous system. Plus, economists now can calculate the GDP 25 times faster and thus spend more time analyzing—and less time waiting for—

calculation results. For BEA, the SQL Server-based solution supports:

- **Faster, better analysis.** BEA successfully reduced its processing time, especially for larger calculations such as the benchmark GDP revision. "Our benchmark calculation times went from eight hours to less than 20 minutes; our quarterly runs went from an hour to under a minute," says Holliday.

"This, in turn, significantly widened our analytical window, which means more time for us to validate assumptions and, ultimately, to derive better quality results for the businesses and government bodies that rely on them," adds Moylan.

- **Increased system reliability and reduced maintenance.** BEA has experienced a significant improvement in the reliability of its mission-critical system. Says Brian Callahan, Chief Information Officer for BEA, "The core calculation kernel is performing very efficiently and reliably without any downtime, which is impressive given the volumes of data and complexities of the business logic representing the entire U.S. economy."

- **Rapid development.** BEA and consultants Rozenshtein and Mehta were able to quickly develop the solution using SQL Server. "We needed very little database administrator support and saved a tremendous amount of development time because of the ease of code tracing and debugging in SQL Server, good XML integration for simpler database interface development, and the software's native capabilities," says Mehta.