White Paper

Advantage™ 2E Web Option

Advantage™ 2E for iSeries 400

Moving AS/400 Applications to the Web

IBM's AS/400, renamed iSeries 400 in October 2000, is one of the most popular non-UNIX, midrange systems for small- and medium-sized businesses. It is one of the leading platforms used by manufacturing, wholesale and retail distribution industries. As more of these organizations search for a viable web strategy to ensure their business futures, many are discovering that the best means to get their critical business data to those who need to access it anywhere, anytime, is through the AS/400 hardware they already own.

As a result, the AS/400 over the years has become positioned as an eBusiness provider; a steady and reliable performer with among the highest customer satisfaction rankings in the IT industry. Those who have chosen the AS/400 as their web server have benefited from the same advantages that it provided for their back-office applications: scalability, availability and ease-of-use features. Tight integration of the AS/400 hardware and operating system has traditionally been beneficial from an ease-of-maintenance standpoint. Bringing application development and web tools into this mix offers even more advantages.

For customers who want a quick, reliable and cost-efficient method for bringing critical business data to the Web, the AS/400 has proven to provide just that—with many distinct advantages to using Windows NT or UNIX servers.

Additionally, when it comes to getting out to the Web, AS/400 users have found the speed of deployment to be another distinct advantage. It is not uncommon for a fully-customized web solution to be deployed in one week or less. With the focus of AS/400 centered on newer models tailored specifically to eBusiness application development, it is easy to see why the AS/400 has continued to gain popularity as a provider of eBusiness solutions.

Advantage™ 2E Application Development for the AS/400

In the past, most application development efforts were focused on providing mission-critical business data to internal users only. The Internet has changed this business scheme—it is now paramount for data to be available to customers, suppliers, vendors and employees over the Web around-the-clock. The AS/400 provides many options for application development, including tools specifically designed to aid in building full-scale business applications. One of these application development tools is Advantage™ 2E from Computer Associates International, Inc. (CA). It was the very first tool developed specifically for building complex, robust AS/400 applications. With more than 6,000 worldwide customers, Advantage 2E has been used to build an estimated 30,000 vital business applications in a multitude of national languages.

Just as many customers have made a long-term investment in the AS/400, they have made the same investment in Advantage 2E for the better part of a decade. With the release of the Advantage™ 2E Web Option, CA offers these customers the ability to further leverage the investment they have made in their applications by bringing them to the Web with no changes to the application programming. This solution provides several business benefits, including significant savings of time and cost. In addition, existing applications are web-enabled to instantly meet the requirements of new market trends—extending data access to customers, vendors and partners. With the Advantage 2E Web Option, CA provides this large customer base with what they need to leverage their investments for success in the eBusiness economy.

CA's Advantage™ 2E Web Option Blueprint Architecture

**Enterprise Portal Solution (User Interface)**
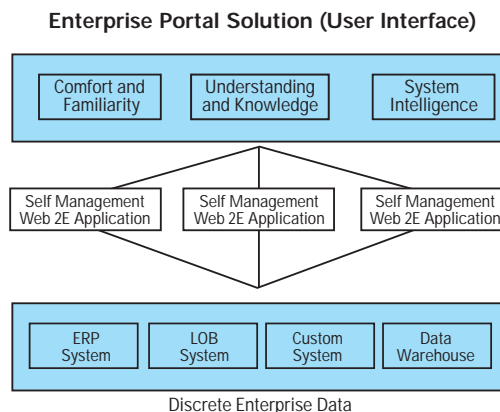
Advantage 2E Web Option provides new functionality to the Advantage 2E development environment. It will be licensed as an add-on option that consists of the Markup Language Generator and the Runtime Router.

Advantage 2E Web Option Overview

To web-enable AS/400 applications, Advantage 2E Web Option allows configurable HTML generation for Advantage 2E panels. In addition to Advantage 2E applications, Advantage 2E Web Option is designed to work with third-party software in which AS/400 applications run. There are two pieces to the Web Option product, a markup language generator and a runtime facilitator.
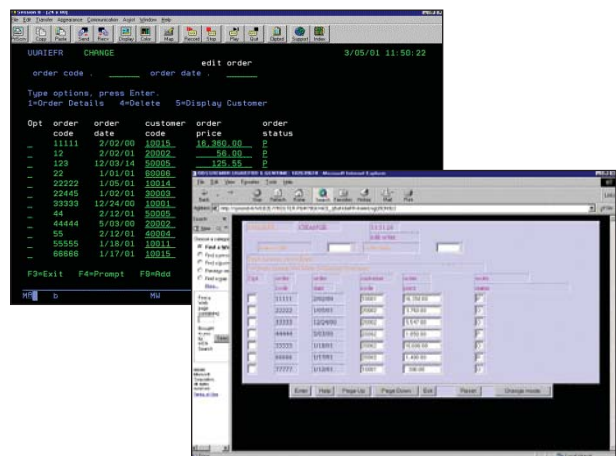
Markup Language Generator

The HTML generator generates a skeleton page for each Advantage 2E screen. A new command, YGENMLS, is provided, which will allow an HTML source member to be generated for a specific DDS (Data Description Specifications) member. This processing includes model and function information, and it parses text and variables to HTML—COBOL, RPG III, RPG IV, as well as the web interface language HTML.
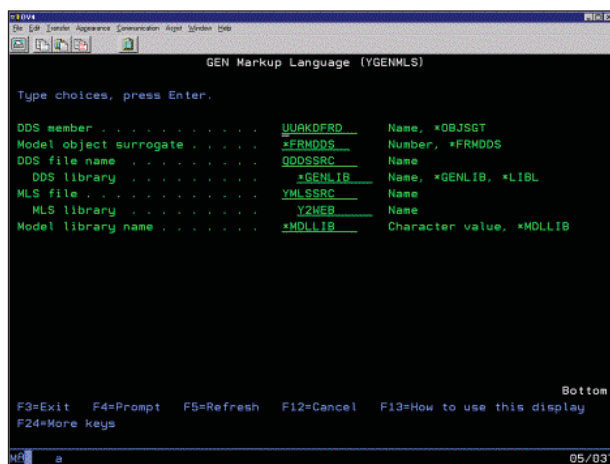
The Advantage 2E development environment features a new command, YGENMLS, that enables users to trigger the Web Option.
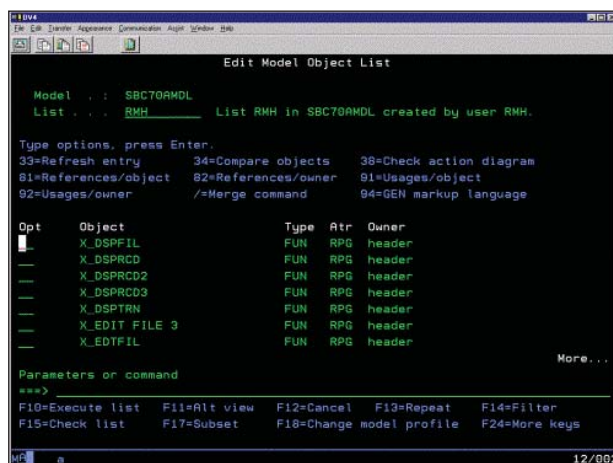
As YGENMLS is running over an Advantage™ 2E Developer model object list, a new command is listed — GEN Markup Language.

An original 5250 Order Details screen, and the HTML skeleton page generated directly from it by the Markup Language Generator.

The skeleton page that is generated for each screen will contain both standard HTML tags and Advantage 2E-specific tags. This skeleton page resides on the AS/400; it can subsequently be edited manually or by using a third-party tool, such as Microsoft Front Page.

As is the case with the AS/400 system in general, the Advantage™ 2E Web Option Markup Language Generator is data driven. The initial release will provide HTML support. Just as Advantage 2E provides easy maintenance for critical data within applications, the same can be said for Advantage 2E Web Option; any control value can be changed in the Advantage 2E Web Option system library.

Advantage 2E Web Option is shipped with various default values, such as background colors, text colors, style sheets, page title and session time-out values. Many of these values are used in the generation of HTML source for panels and in the Just-In-Time (JIT) creation of HTML pages by the router. Other values hold information necessary for the router and generator processing. Changes can be easily incorporated at any level to reflect user specifications.

As previously stated, any external HTML editor can be used to make changes to the generated skeletons. Advantage 2E Web Option contains an automatic naming system for each generated skeleton page. These names can be changed and customized to user specifications.

The skeletons are merged with the 5250 data stream in order to display HTML pages in a web browser. The browser makes repeated calls that merge and convert 5250 data into HTML. Changes that need to be made to the skeletons have no effect on runtime performance.
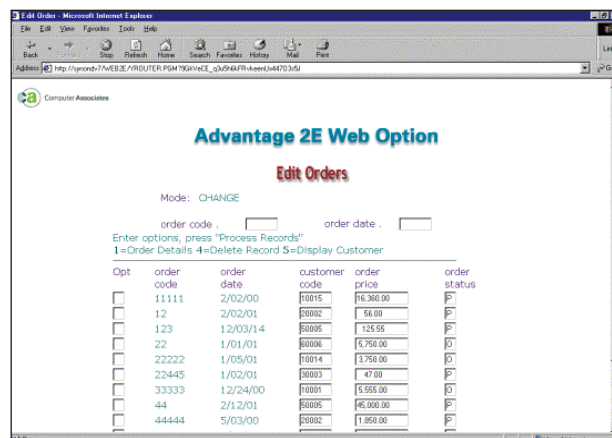
The same generated screen after being run through an external HTML editor.

Skeletons can be written for other AS/400 applications not written in Advantage 2E, whether DDS is available or not. Default skeletons are included with Advantage 2E Web Option for common IBM AS/400 screens.

In order to associate a screen with an HTML source member, some form of identification which links that particular screen to a member in the HTML source file is needed. This is done by using a Screen Identifier — a unique, ten-character code in a specified format — either generated by Advantage 2E in the DDS or created manually. Each panel must have a Screen ID in order to generate HTML for any existing Advantage 2E functions.

When the Screen ID is generated in the DDS, a record is created in the screen cross-reference file. It is used by the Web Option in two areas — in the actual HTML generation and in displaying the screen to retrieve its skeleton name.

Runtime Environment

Since the Advantage 2E Web Option runtime server is completely based on the AS/400, there is no need for emulation software such as Client Access; it will create web pages to be displayed in any browser. Currently, CA offers portal technology from which Advantage 2E/Advantage 2E Web Option applications can be run.

The runtime environment consists of one new library that must be installed on the AS/400 — the Y2WEB. This library contains both the server and router programs.

The server program continuously monitors the runtime environment in which the Advantage 2E Web Option router programs runs. This is done by using a simple new command to start the Advantage 2E Web Option server job. It also controls the running of the specific jobs that are accessed through the router and performs clean-up operations when those jobs are ended.

The server job does not need to be actively running to use Advantage 2E Web Option — in that case, no monitoring would be done, and such things as time-outs would not take place. At a minimum, an initialization would need to take place once a day.

The router is a program that resides on the AS/400 and is called repeatedly from the browser. It performs job and session control and management on the AS/400. It also performs 5250 to HTML merging and HTML to 5250 conversions. It is also the part of Advantage 2E Web Option that uses the screen IDs to identify screens, merge them with the generated skeletons to display web pages, and build Just-In-Time or HTML screens where no skeleton is available.

Each time the router is called, it checks to see whether the user is already running a browser-initiated session on the AS/400. Initially, when a request is given to start the router, it uses IBM APIs to create an interactive job. This interactive job creates a User Space and Data Queue for that session, which is used for data flow between the router and the browser.

The router also performs the ongoing task of receiving data from the AS/400 in the form of a 5250 data stream. This data is parsed into separate components that build the table of data items in the generated skeleton. The router also performs the ongoing task of receiving data from the AS/400 in the form of a 5250 data stream. From there, the Screen Identifier is created, and the data is interpreted and merged with an HTML skeleton, which is either already generated or created instantly by the router using default HTML values. This creates an HTML page that is then sent to the browser to be displayed.

As data entered on the panel is accepted, the router puts it into 5250 data format and sends it to the AS/400 to be processed by the application program. The skeletons are merged with the live 5250

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data to create the HTML page that is displayed in the web browser. The part of the router that processes this merging of data and the generated skeleton takes care of all related ongoing tasks through the Advantage 2E Web Option-specific tags, programs and system data. Once the application is ready to run, it should be able to call any function, and all panels should be displayed in the browser. There is no need to generate HTML for all function panels—those that don't have a screen ID, and therefore no HTML skeleton, will have a basic HTML page created "Just-In-Time" (JIT) by the router. This JIT page is built using default values provided in the Web Option for things such as background color, text color and page title.
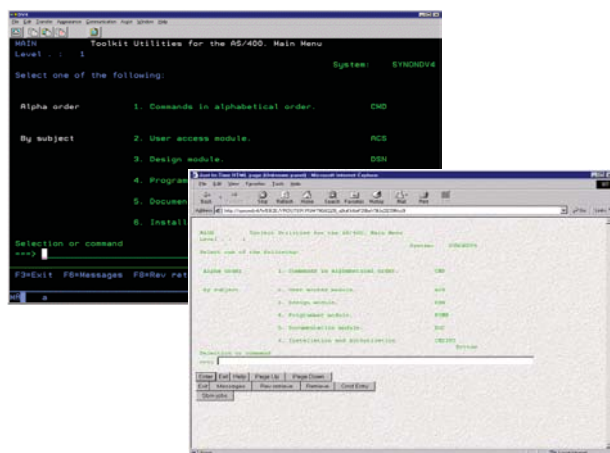
Standard AS/400 sign-on screen and the resulting Just-In-Time (JIT) page created.

The JIT GUI screen bears the closest resemblance to the original green screen, since the translation is done straight from the 5250 data stream. However, if screen customization is the goal without the basic default HTML attributes, skeletons could be generated and modified.

Summary

Application development, once primarily focused on delivering applications for internal customers, has been transformed dramatically with the growth of eBusiness. As a result, new market trends that are enabling further growth in the AS/400 application development space have emerged. Computer Associates International, Inc. is committed to the ongoing development of Advantage 2E and has prioritized the following enhancements for this powerful tool:

• Delivering web solutions
• Application integration
• XML as a means for passing data throughout applications from suppliers/vendors/customers/.
    Componentization of business logic to build these applications. In the future, these components can be delivered in the form of Enterprise JavaBeans (EJBs).

    The delivery of the Advantage 2E Web Option is one important step that CA has taken in fulfilling this vision. For customers who have invested in Advantage 2E over the past decade, the Advantage 2E Web Option provides additional value by allowing them to create web solutions directly from an existing Advantage 2E model without the need to re-architect the business logic in these applications. In the future, XML will play a prominent role in the ongoing evolution of the Advantage 2E Web Option product. In addition, the Advantage 2E base product, which already has business logic componentization capabilities, will have the ability to deliver components in the form of EJBs for the J2EE environment. Advantage 2E Web Option is an important part of CA's ongoing strategy for delivering cutting-edge application development solutions.

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