Reusable Software Technology

Timothy E. Morgan
Norfolk State University
1995 Langley Aerospace Research Summer Scholar Program

Under the direction of
Calvin Mackey

Space and Atmospheric Sciences Program Group
Atmospheric Science Division
Data Management Branch

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Abstract

The objective of the Reusable Software System (RSS) is to provide NASA Langley Research Center and its contractor personnel with a reusable software technology through the Internet. The RSS is easily accessible, provides information that is extractable, and the capability to submit information or data for the purpose of scientific research at NASA Langley Research Center within the Atmospheric Science Division.

Introduction

The Reusable Software System provides a respository for reusable software developed by NASA and contractor personnel engaged in atmospheric science research and support activities at the Langley Research Center. This system also provides links to a number of other established software repositories. The RSS was undertaken as a Quality Action Team (QAT) project by Science Applications International Corporation (SAIC) and is presently a joint effort with the staff of the NASA Langley Research Center Atmospheric Science Division.

The World Wide Web (WWW) is the mechanism that allows access to the Reusable Software System. The system consists of a variety of HyperText Markup Language (HTML) documents, also know as home pages, that display text, graphics, as well as sounds. These HTML documents provide information for the entire Internet world. Each HTML document is an element of a growing reusable software technology allowing individuals to combine their efforts and resources to centralizing important and useful software.

Quality Action Team and the Reusable Software System

The objective of the Quality Action Team is to promote the exchange and efficient use of computer software among various groups within the division. The widespread use of workstations, PCs and Macintoshes has generated a growing need for a variety of software and methods for allowing these different platforms to work together. New versions of software packages are being purchased or developed in-house, but not everyone in the division has access to these tools. While proprietary rights may limit the sharing of some of the commercial packages, no such restrictions exist for software developed within the government. Therefore the creation of a system based reusable software technology would provide a company with accessible information that can be extracted and submitted easily. The Quality Action Team addresses the following key issues:

1) Reuse/sharing of software developed by Division employees.
2) Transfer of unused hardware components among different groups.
3) Software quality assurance and virus protection.
4) Legality of sharing commercial software packages.

Chuck McKinley serves as Chairman for the Quality Action Team. The members of this team consist of Vince Brackett, Bill Chandler, Patrick Purcell, Chuck Turnitsa, David Ayers, and my mentor

Calvin Mackey. Calvin Mackey and the Data Management Office (DMO) were approached by Chuck McKinley to become a member of the Quality Action Team due to DMO's desire to create their own reusable software technology.

Chuck McKinley and Calvin Mackey with the assistance of DMO and the QAT established the NASA Langley Research Center Atmospheric Science Reusable Software System (RSS). The Reusable Software System is accessible through the World Wide Web on the Internet. The system is accessed through a home page which allows individuals to extract information from the RSS that will be useful in atmospheric research and projects. The RSS Home Page consists of information regarding applications, computer graphics, CASE tools, programming code, site-licensed software, compendium of universal constants, freeware, commercial databases, atmospheric data collections, other repositories, and other resources.

World Wide Web

The Web is an access mechanism layered atop existing network services that provides a consistent view of many different services. The World Wide Web is comprised of three systems: hypertext, the Internet, and multimedia. Hypertext is text within a document which provides a direct link to another document. The Internet is a global system of computer networks. Multimedia is the combination of different presentational technologies to appeal to multiple senses. The WWW is a unique tool which allows you to access not only text but also graphics, sound, or video information from all over the Internet world.

Hypertext MarkUp Language

HyperText Markup Language is a simple markup system used to create hypertext documents that are portable from one platform to another. HTML markup can represent hypertext news, mail, documentation, and hypermedia: menus of options; database query results; simple structured documents with in-lined graphics; and hypertext views of existing bodies of information. HTML is how a WWW browser displays its multimedia documents. The documents themselves are plain text files, also known as ASCII, with special "tags" or codes that the WWW program knows how to interpret and display on your screen. These HTML special "tags" define the structural elements in a document such as headers, citations, addresses, etc.; layout information such as bold and italics; the use of in-line graphics together with the ability to provide hypertext links. HTML, along with the World Wide Web, were invented by Tim Berners-Lee of the CERN High Energy Particle Physics Laboratory in Geneva, Switzerland. HTML allows you to:

1) Publish documents to the Internet in a platform independent format
2) Create links to related works from your document
3) Include graphics and multimedia data within your document
4) Link to non-World Wide Web information resources on the Internet

HTML is written in a text editor and by using special HTML commands the user is able to manip-

ulate the text to whatever style or form the individual requires. The HTML commands are simple and easily understandable:

<H1>, <H2>, . . . , <H6> - Change the size of the font
<P> - Marks the end of a paragraph

 - Starts a new line
<B> - bold
<I> - italics
<UL> - underline
<A HREF> - hyperlink

These commands are just a few of many which allow the user to do numerous things with the document.

The command, <A HREF>, is an extremely important part of HTML. < A HREF> is the hyperlink function that allows quick movement through documents while browsing the Internet. The <A HREF> provides a link to the direct path of a document without the bother of opening command windows and searching for the pathway. The pathway to the HTML document is called the Uniform Resource Locator (URL).

Netscape

A Mountain View, CA - based corporation originally known as Mosaic Communications Corp., Netscape was founded in April 1994 by James H. Clark, founder of Silcon Graphics Inc., and Marc Andreessen, creator of the original NCSA Mosaic prototype. Led by Andreessen and a team of software developers, Netscape launched its beta version in October 1994 and quickly took the world by storm. Netscape's browsers come in three flavors: UNIX, Windows, and Macintosh, all of them virtually identical from the user's perspective.

Netscape sought to stand apart from the masses by supporting features not included in the HTML specifications. Netscape established the inclusion of special extensions, non-standard HTML, that allowed users to format data on pages in a more elegant fashion than had previously been available, such as wrapping text around a graphics image. Other extensions for special features included blinking, scaling the size of the fonts used, and centering were also added.

CERES Software Bulletin's Home Page

The Cloud and Earth's Radiant Energy System (CERES) Software Bulletin's Home Page was the first HTML document . Maria Mitchum, member of the Data Management Office, supplied the bulletins and requested that they be posted on the Internet for easy readable access. The bulletins were sent through email in a file and had to be converted into postscript form. The application Ghostview was needed to display the bulletins on the screen. Ghostview allows the bulletin to be displayed on the screen while the Netscape window remains free. The CERES Software Bulletin's HTML document read the following code:

```
<title>CERES DMS Software Bulletins </title>
<hr>
<h1>Clouds and Earth's Radiant Energy System (CERES)</h1>
<IMG SRC="http://asd-www/tmorgan/news.gif">
<hr>

<h2>CERES DMS Software Bulletins</h2>
<h3>
<ul>
<li><a href="http://asd-www/ceres/CERES_SB_95-01.ps">CERES Bulletins Purpose & Mailing
List</a>
<li><a href="http://asd-www/ceres/CERES_SB_95-02.ps">CERES Standard Routine Prologue</a>
<li><a href="http://asd-www/ceres/CERES_SB_95-03.ps">CERES Release 1 Grid Bulletin</a>
<li><a href="http://asd-www/ceres/CERES_SB_95-04.ps">Revised CERES Standard Routine Pro-
logue</a>
<li><a href="http://asd-www/ceres/CERES_SB_95-05.ps">Release 1 Data Product Module Guide-
lines</a>
<li><a href="http://asd-www/ceres/CERES_SB_95-06.ps">F90 Debugger General Information</A>
<ul>
<li><A href="http://asd-www/ceres/F90-Users-Notes">F90 Users Notes </a>
</ul>
<li><a href="http://asd-www/ceres/CERES_SB_95-07.ps">CERESlib README Guidelines</a>
</ul>
</h3>

<p>
<address>Last Updated Thursday, July 26, 1995 15:15 EST<address>
<a href="http://asd-www/cgi-bin/tem_home.cgi"> <i>Timothy Morgan</i></a>

<hr>
<i><a href="http://asd-www/ceres/docs.html"><img src="http://asd-www/tmorgan/greystar.gif">
Back to On-line Documentation</a></i></ul>
```

This HTML document is located at this URL, http://asd-www/ceres/bulletins.html.

Reusable Software System Home Page

Calvin Mackey expressed a need for more HTML features to be incorporate into the Reusable
Software System (RSS) Home Page. Calvin Mackey wanted to display the time, date, and the num-
ber of times the page had been accessed at the top of the page. To do this two programming lan-
guages, awk and perl, had to be used. Awk was used to keep an accurate count of the number of times

the page had been accessed. Perl was used to display the current time and date.

Mark Shipham, member of DMO, provided technical support in the creation of the awk program. The program read the following code:

```
#!/bin/sh
awk '{print (int($1)+1)}' /home/docs/ceres/RSSHOW_MANY > /home/docs/ceres/temp
\mv /home/docs/ceres/temp /home/docs/ceres/RSSHOW_MANY
```

The program called for the creation of a file called how_many. How_many is the file that stores the number of times the page had been accessed. The program calls the file, how_many, adds one to whatever number is currently in the file, then displays that number on the home page.

Calvin Mackey provided technical support in the development of the perl program. The date program read the following code:

```
    #!/bin/sh
DATE=/bin/date
echo Content-type: text/plain
echo if [ -x $DATE ]; then   $DATE
else echo Cannot find date command on this system.
fi
```

The first line of code, #!/bin/sh, tells the computer this is a perl script file. Without that first line the computer would not recognize the commands that follow. The time is a standard part of every UNIX system and does not need a special perl program but time is still called by the perl program in the RSS HTML document.

When modifications were made to the RSS Home Page, the programs were implemented into the RSS HTML documents. For the programs to work the RSS HTML document had to be moved to a different directory, cgi-bin. This directory allows all executable programs to run therefore the RSS HTML document had to be converted into a perl script file, RSS1.cgi. The code that was added to the document allowed the computer to read the text in the new directory. Key commands such as echo, #!/bin/sh, and #!/bin/csh were recognized by the computer as perl commands. These lines were recognized as awk and perl programming code:

Date and Time (Perl Program)
    echo "`date -u '+It is %h %d, 19%y and the current time is %H:%M Z (GMT).'`"
Access Number (Awk Program)
    echo "`/home/docs/htbin/RSSCOUNT`"
    echo "<B>`cat /home/docs/ceres/RSSHOW_MANY`</B>"

Since the RSS HTML document had been converted to a perl script file, a new file had to be created to call the document to the screen. The new file, named RSS, calls the document to be executed through the cgi-bin directory. The RSS file also resides in the cgi-bin directory. The RSS Home Page

is founded at this URL, http://asd-www/cgi-bin/RSS.

Informix Tutorial

Calvin Mackey also requested the Informix Tutorial be transferred into a HTML document. Informix is a relational database management system (DBMS) that allows the user to create tables of data and to relate them to each other based upon common fields. Informix is needed by the ERBE/CERES project for tracking purposes.

The Informix tutorial was installed on WWW to provide easy access and increase the learning-curve efforts of new members of the ERBE/CERES project. The Informix tutorial is informative and descriptive allowing the viewer full comprehenion of the material. When all revisions are completed, the tutorial will be placed in on the RSS Home Page.

Conclusion

The CERES Software Bulletin Home Page, the Reusable Software System Home Page, and the Informix Tutorial are a part of the resuable software technology that is a vital part of Langley Research Center. Each HTML document offers employees of NASA, contractor personnel, as well as Internet users the opportunity to be informed and educated on the many research projects at NASA. Placing this wealth of knowledge on the Internet provides easy access, extractable information, and submitable information to increase the communication and broaden the research tools at Langley Research Center.

With the motto "better, faster, cheaper" at the front of a new era, a reusable software technology, like the Reusable Software System at Langley Research Center, will become increasingly more important as projects and research require software that has already been created. The Reusable Software System will provide NASA Langley Research Center with the technology to incorporate the many technical research projects in a central location. The Atmospheric Science Division of NASA Langley Research Center has realized the importance of reusable software technology therefore the Reusable Software System is a step in a positive direction.

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