Creating Dynamic Web Pages with Application Dispatcher:

Getting Started with SAS/IntrNet™ Software

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ABSTRACT

This "virtual" hands-on workshop will give a basic introduction to using SAS Application Dispatcher to create World Wide Web pages on demand. Workshop participants will learn how to create an HTML form which will invoke a SAS program on a server via the Application Dispatcher. They will also learn how to construct a SAS program which produces web pages upon request from such an HTML form. No previous knowledge of HTML is required.

Overview

Consider the following transaction. Jane Doe fires up her Web browser and browses her way to my Web page. Looking at my Web page she finds she can request further information on a variety of topics. She makes a few selections, and clicks on the Submit button. Then SAS on my server wakes up, processes a set of data and sends a bar chart back to her browser showing the information she requested.

What did I have to do to make this possible? Two things, essentially: (1) create a Web page that contains a form that references my SAS program and (2) write the SAS program that collaborates with this Web page. This workshop teaches the basics on how to create these two components.

Figure 1. Jane's Web browser sends a request to my Web server asking for a copy of my Web page. This HTML file is duly sent to Jane's computer where her browser interprets the HTML and displays my Web page. In her browser Jane selects options and enters data in the HTML form specifying what further information she is requesting. Then she clicks on the Submit button.

Figure 2. Jane's browser assembles her selections into a message, which is sent to my Web server. My Web server sees that the request is addressed to my Application Broker, starts "Broker", a CGI program included in the SAS/IntrNet package, and passes it the message from Jane's browser. The Application Broker interprets and processes the request data and then establishes contact with my Application Server. The Application Server, a SAS session waiting for action, processes the input from Broker, creates a fileref named _*webout*, which points back through Broker to Jane's browser, and creates a set of macro variables containing the request data. The Application Server then finds the specified SAS program that I wrote and runs it with those predefined macro variables. The macro variables are what convey information from Jane's browser to my SAS program. Output from this SAS program is written to _webout, which streams the output to the Application Broker. Broker does a little processing of the output before passing it to the Web server. The Web server then sends the output to Jane's browser.

That's probably more detail than you care to know, but someday you'll thank us for this.

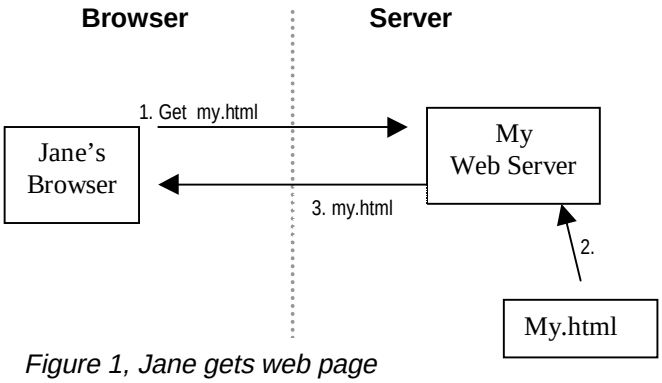


Figure 1, Jane gets web page

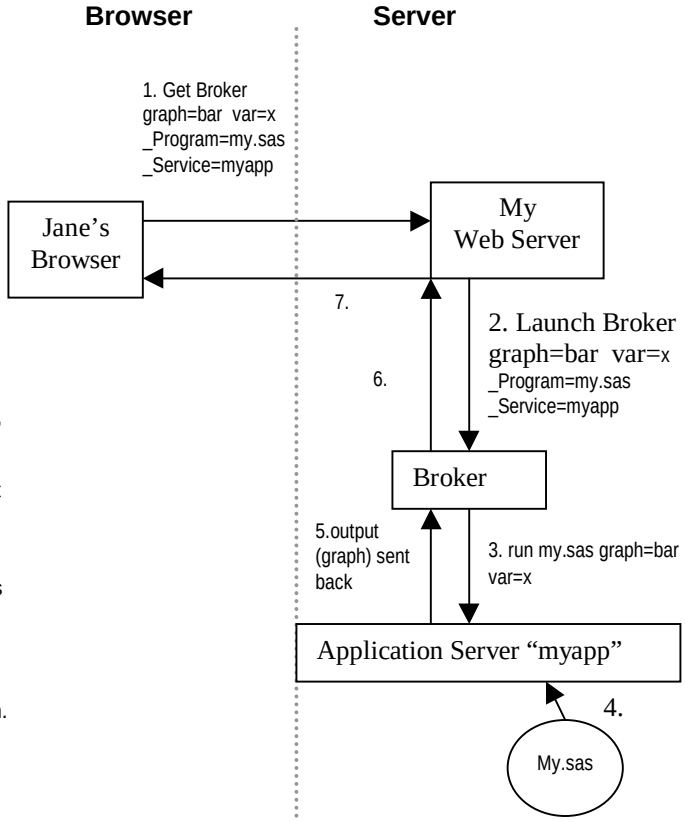
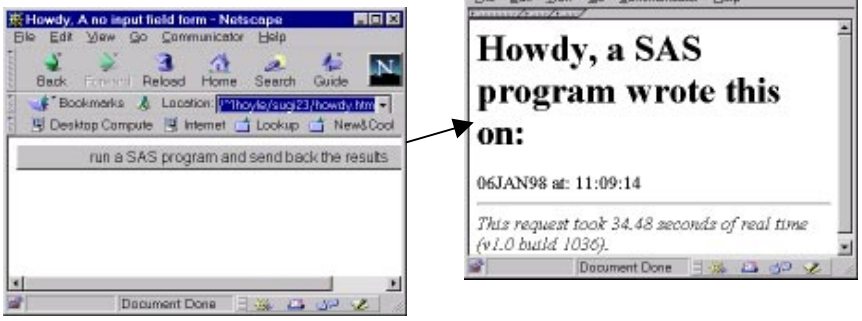


Figure 2, Jane runs my SAS program

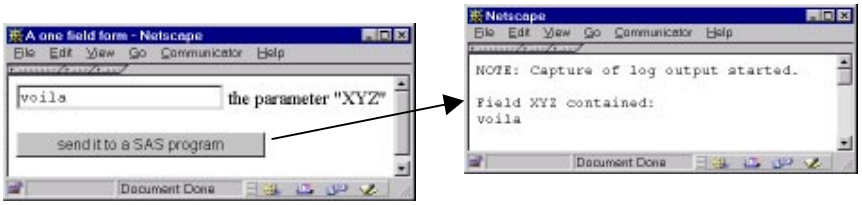
Example Applications

HTML Form **Results from SAS**

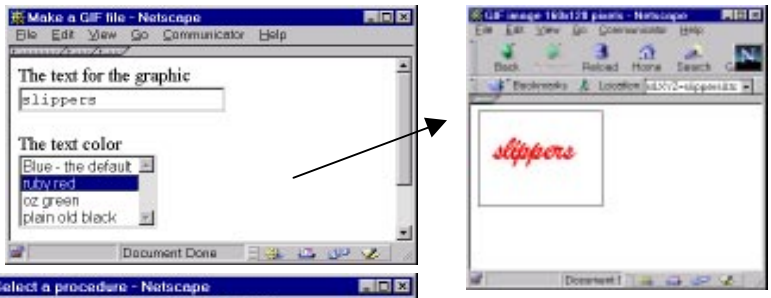
This workshop will use six example applications, each of which has an HTML file and a SAS program. Thumbnails of what the user sees when using the applications are shown on this page, with the HTML form on the left and the output from the SAS program, as delivered back to the browser, on the right.
The first example, in the first row, is a simple “Howdy World” program. It also displays the time to show that an application with no input values can deliver dynamic information.



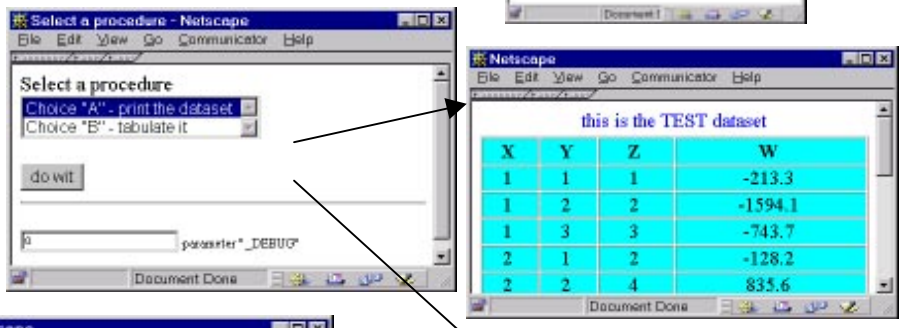
The second application prints back the value of an input parameter. The third (not shown) prints back selections from a multiple select box.



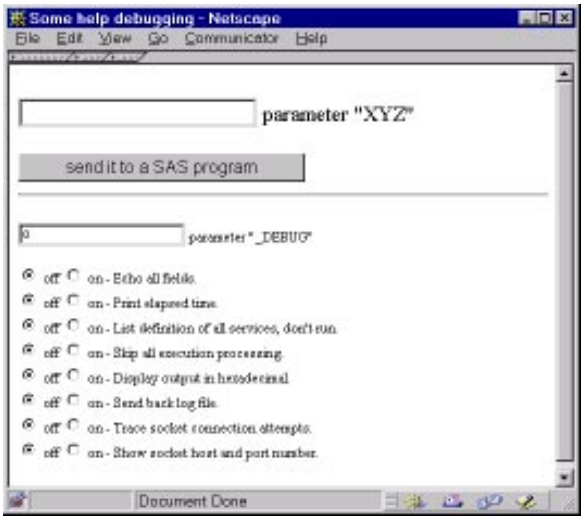
The fourth application sends back the value of the input field in a graphic image file (GIF).

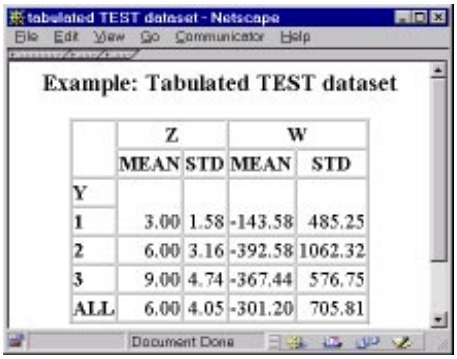


The fifth application uses an input parameter to choose between two procedures.



The final application shows some debugging tools.





Howdy World

This Dispatcher application runs a SAS program that prints a message and the time. This is a dynamic application in that it produces a different page each time it is run, but it requires no input parameters from the user.

In order for the SAS program to be run, the HTML file which requests it must contain three references: a pointer to SAS Institute supplied program named "Broker", the name of a Broker service, and a reference to the SAS program to be run.

The pointer to Broker appears in the "*action=*" clause of the HTML "*FORM"* tag. Broker itself is an executable which your system administrator configures to have one or more "*services*". Each service corresponds to one or more SAS sessions running on a server.

The name of the service to be used appears as the value of a field named "*_SERVICE*" in the HTML form. It can be user selectable or it can appear in a "hidden" field as it does in figure 3. In this case the value "*mwsug98*" does not appear on screen for the user since the type of the INPUT field is "hidden". It is, however, passed to the server as "*_SERVICE=mwsug98*" when the form is submitted.

The name of the SAS program to run in figure3 is "*howdy.sas*". Its location is pointed to by the libname "*clientXX*". This reference is passed to the server as"*_PROGRAM=clientXX.howdy.sas*". Dispatcher applications may also run source programs, SCL code, or macros in SAS catalog entries,

The SAS program, clientXX.howdy.sas, which is referenced by the "*_PROGRAM*" field above, is shown in figure 4. The important features of this program are the reference to the output fileref "*_webout*", and the HTTP header which is the first output sent to _webout.

When Broker sets up for howdy.sas to be run, it inserts a fileref to _webout at the beginning of the code to be run. Anything written to this fileref ends up being sent back to the browser from which the form in figure 3 was submitted.

In order for the browser to interpret this output correctly, it must be preceeded by *a "Hypertext Transfer Protocol (HTTP)*" header. This header must end with a null line. Note the "/" at the end of the highlighted "put" statement in figure 4. The "/" is necessary in that it generates the needed null line. The HTTP header in this example, *'Content-type: text/html'* , informs the browser that what follows is to be interpreted as HTML. While many browsers will display output without any HTML codes, it is a good idea to include at least the required elements: <HTML></HTML>, <HEAD></HEAD>, and <BODY></BODY>.

```
<HTML>

 <HEAD>
 <TITLE>Howdy, A no input field form</TITLE>
 </HEAD>

 <BODY>

  <FORM    action='http://brokerpath/broker'>

   <INPUT          type=hidden
                   name=_SERVICE
                   value=mwsug98>

   <INPUT          type=hidden
                   name=_PROGRAM
                   value=clientXX.howdy.sas>

   <INPUT          type=submit
                   value="run a SAS program ">
  </FORM>

 </BODY>

</HTML>
```

figure 3, howdy.htm

```
/* ---------------------------------------------------------- */
/* howdy.sas  - a hello world program                         */
/*     for trying the application dispatcher.                 */
/* ---------------------------------------------------------- */

data _null_;

file _webout;

t=time();
d=date();

put 'Content-type: text/html'/;

put '<H1>Howdy, a SAS program wrote this on:</H1>';
put  d date7. ' at: ' t time. ;

run;
```

figure 4, clientXX.howdy.sas

A Form With One Input Field

The second example, shown in figure 5, adds a field to the form into which a user can enter information. In this particular case the field has a name of “XYZ”, and has no default value. If a user were to enter the value “13” into the field, the browser would send “XYZ=13” to Broker when the form was submitted. A separate *name=value* pair is sent for each field entered in the form.

```
/* ------------------------------------------------------------ */
/* 1field.sas - Reads one field from the browser                */
/* ------------------------------------------------------------ */

%global XYZ;

 options nosource nonotes;
      /* ---------------------------------------------- */
      /* send the log window to the browser             */
      /* ---------------------------------------------- */

%out2htm(capture=on, window=log );

data _null_;

 sg=symget('XYZ');

 put "Field XYZ contained: " / sg ;

run;

%out2htm(htmlfref=_webout,
      capture=off,
      window=log,
      runmode=s,
      openmode=replace);
```

figure 6, clientXX.1field.sas

```
%macro noexit(myname);
data _null_;
m = symget("&myname");
n = translate(trim(left(m)),
            '                              ',
            '_____________________________',
            '%&"()";:,',
            '  ',
            '__',
            '0A0D'x);
call symput("&myname",trim(n));
run;
%mend noexit;
```

figure 7, a macro to remove nasty characters

```
<HTML>
 <HEAD>
 <TITLE>A one field form</TITLE>
 </HEAD>
 <BODY>

  <FORM action='http://brokerpath/broker'>
   <INPUT      type=hidden
               name=_SERVICE
               value=mwsug98>
   <INPUT      type=hidden
               name=_PROGRAM
               value=clientXX.1field.sas>

   <INPUT type=text
               name=XYZ> the parameter "XYZ"
   <P>
   <INPUT      type=submit
               value="send it to a SAS program">
  </FORM>
 </BODY>
</HTML>
```

figure 5, 1field.htm

The SAS program clientXX.1field.sas, shown in figure 6, receives the value “XYZ” as a predefined macro variable. Broker sets up this macro variable automatically for each name=value pair it receives. It is a good idea, though, to have a %global statement for each parameter the SAS program references. This will force the creation of an empty macro variable when no name=value pair is sent.

An Application Dispatcher program can reference a macro variable containing a form parameter (e.g. XYZ) as:
”&XYZ”;
or
%superq(XYZ);
or
with symget(‘XYZ’);
Parameters are also available to an Application Dispatcher SCL program via an SCL list.

Using the “&XYZ” method is a security risk. It can be used to insert undesired SAS code into your application. The symget and SCL list methods are safest. Figure 7 shows a sample macro to strip out dangerous characters from the form fields. These include the percent sign, ampersand, quotes, semicolon and comma, as well as carriage return and line feed.

You may also want to check the length of a parameter. In figure 6 "XYZ" is read into the variable sg and then printed. It may get truncated, but this will not crash the program. In figure 8b the statement:

```
put "You ordered %superq(FIXINS0) topping.";
```

will crash the application if the quoted string gets longer than 200 characters.

Note, though, that this example doesn’t explicitly write an HTTP header, unlike the clientXX.howdy.sas example. This is because the “*runmode=s*” option of the %out2html macro indicates that the application is running in “server” mode. When both “runmode=s” and “openmode=replace” are specified, an HTTP header is automatically written.

Multiple Selection Parameters

An HTML form can allow multiple values to be selected for a single parameter. Figure 8a shows an HTML file which defines a select box which allows a user to select any combination from pickles, mustard, maple syrup and onions. By default the first three are selected.

```
<HTML>
 <HEAD>
 <TITLE>A multiple select form</TITLE>
 </HEAD>
 <BODY>

  <FORM action='http://brokerpath/broker'>
   <INPUT          type=hidden
                   name=_SERVICE
                   value=mwsug98>
   <INPUT          type=hidden
                   name=_PROGRAM
                   value=clientXX.multi.sas>
<P>
What do you want on your veggie burger?<BR>
   <SELECT name=FIXINS MULTIPLE >
                   <OPTION SELECTED>pickles
                   <OPTION SELECTED>mustard
                   <OPTION SELECTED>maple-syrup
                   <OPTION>onions
   </SELECT name=MXYZ MULTIPLE >
<INPUT             type=submit
                   value="send it to a SAS program">
  </FORM>
 </BODY>
</HTML>
```

figure 8a, multi.htm

```
/* ------------------------------------------ */
/* multi.sas - Reads multi select             */
/* ------------------------------------------ */
%global  FIXINS;
%global  FIXINS0 FIXINS1;
options nosource nonotes;
 %out2htm(capture=on, window=log );
      /* ______________________________________ */
      /* Make the "0" and "1" macro variables   */
     /* if necessary. Simplifies later code     */
      /* ______________________________________ */
%macro prep;
data _null_;                    /* no parameters  */
%IF %superq(FIXINS)= %THEN %DO;
  call symput("FIXINS0","0");
%END;
%ELSE %DO;                      /* at least 1     */
                               /* just 1         */
  %IF %superq(FIXINS0)= %THEN %DO;
    call symput("FIXINS0","1");
  %END;
%END;
    call symput("FIXINS1",symget("FIXINS"));
run;
%mend prep;
%prep
                    /* --------------------------- */
                    /* use the macro variables     */
                    /* --------------------------- */
%macro use;
data _null_;
%IF %superq(FIXINS0)=1 %THEN %DO;
  put "You ordered %superq(FIXINS0) topping.";
%END;
%ELSE %DO;
  put "You ordered %superq(FIXINS0) toppings.";
%END;

 %IF %superq(FIXINS0) ne 0 %THEN
  %DO fx= 1 %TO %superq(FIXINS0);
    f=symget("FIXINS&fx");   put f;
  %END;
run;
%mend use;
%use

 %out2htm(htmlfref=_webout,  capture=off,
          window=log   runmode=s,
          openmode=replace);

%let FIXINS=;
%let FIXINS0=;
%let FIXINS1=;
```

figure 8b, clientXX.multi.sas

Suppose the default is submitted. The browser will send FIXINS=pickles&FIXINS=mustard&FIXINS=maple-syrup. Broker would create the following macro variables in this situation.

```
%let FIXINS0=3;
%let FIXINS=pickles;
%let FIXINS1=pickles;
%let FIXINS2=mustard;
%let FIXINS3=maple-syrup;
```

If only onions were picked Broker would set up only:

```
%let FIXINS=onions;
```

Figure 8b shows an example of SAS code to handle the form in figure 8a. Note that FIXINS, FIXINS0, and FIXINS1 are declared global so that they always exist even when one or no selection was made in the browser.

The macro **prep** sets values for FIXINS0 and FIXINS1 in cases were Broker doesn't. If, for example, only one choice is selected, Broker would not set FIXINS0 and FIXINS1. In this case, to make later coding easier, prep sets FIXINS0 to 1. FIXINS1 is always set to the same value as FIXINS.

The macro **use** in figure 8b shows how the parameters might be used. In this simplistic example FIXINS0 is used to loop through the selections and echo them back to the user.

Creating a Graphic

The next example has a form which has 2 user editable fields. The second field is a “select box” which allows the user to select from a list of options. When the form is submitted, the browser receives a graphic image (a GIF file).

```
<HTML>
 <HEAD>
 <TITLE>Make a GIF file</TITLE>
 </HEAD>
 <BODY>
  <FORM action='http://brokerpath/broker'>
  <INPUT        type=hidden
                name=_SERVICE value=mwsug98>
  <INPUT        type=hidden
                  name=_PROGRAM value=clientXX.slide.sas>

  The text for the graphic<BR>
  <INPUT        type=text name=XYZ>

  <P>The text color<BR>
  <SELECT       name=tcolor size=4>
   <OPTION value="blue" SELECTED>Blue </OPTION>
   <OPTION value="red">ruby red</OPTION>
   <OPTION value="green">oz green</OPTION>
   <OPTION value="black">plain old black</OPTION>
    </SELECT>

  <P>
  <INPUT type=submit value="send me a GIF file">
  </FORM>
 </BODY>
</HTML>
```

figure 9a, slide.htm

```
/* ---------------------------------------------------- */
/* slide.sas  - show the input as a GIF file            */
/* ---------------------------------------------------- */

%global XYZ TCOLOR;

/*  these statments can be used to test without the application
dispatcher
filename _webout 'd:\InetPub\wwwroot\sugi23\grphout.gif';
%let XYZ=testme;
*/

    /* ---------------------------------------------------- */
    /* generate an HTTP header for a GIF file               */
    /* don't run this data step if testing locally          */
    /* ---------------------------------------------------- */
data _null_;
 file _webout;
 put 'Content-type: image/gif'/;

run;

        /* ------------------------------------ */
        /* use a GIF graphics device            */
        /* ------------------------------------ */
goptions device=gif160
      gsfmode=replace
      gsfname=_webout;

   /* ---------------------------------------------------- */
   /* set the color from an input parameter                */
   /* ---------------------------------------------------- */

goptions ctitle=%superQ(TCOLOR);

        /* ---------------------------- */
        /* generate the graphic         */
        /* ---------------------------- */

proc gslide frame;
  note h=10  move=(8,15) f=brush %superQ(XYZ);

run;
```

figure 9b, clientXX.slide.sas

The SAS program clientXX.slide.sas first writes an HTTP header to tell the browser that a GIF graphic follows. That header is **'Content-type: image/gif.** Note that the SAS program should write no other text to _webout, otherwise the browser would see a corrupted gif file.

Selecting one of the GIF drivers creates the graphic file. In figure 9b the driver is “*gif160*” which produces an image 160 pixels across. Specifying the *gsfname=_webout* graphic option results in the graphic being sent back to the browser. The gsfmode=replace option causes the driver to write a proper internal header for the graphic.

The actual creation of the graphic can be done by a number of components of the SAS system. In figure 9b, PROC GSLIDE is used to create a slide from the contents of the XYZ field.

Selecting Code

The Dispatcher program clientXX.iffy.sas is shown in the 4 part figure 10.This application shows the use of an input field to select code to be executed.
The initial section in figure 10a creates a test dataset.

Figure 10e contains the code which actually makes the selection. If the value of the input field is "*A*", then the macro "*CHOICEA*" is invoked. Input of "*B*" causes "CHOICEB" to be invoked. Any other input invokes "OOPS".
Figure 10b contains the macro definition for CHOICEA. It uses the "%ds2htm" macro to send the browser the test dataset as an HTML table. Figure 10c contains the definitions for CHOICEB. ChoiceB uses the tab2htm macro to send back an HTML table from a PROC TABULATE. OOPS in Figure 10d handles errors.

```
/* ---------------------------------------------------- */
/*  iffy.sas - select logic based on a form             */
/* ---------------------------------------------------- */

%global CHOICE;

options mprint;

        /* ---------------------------- */
        /* make a test dataset          */
        /* ---------------------------- */

data test;
do x=1 to 5;
 do y=1 to 3;
   z=x*y;
   w=round(1000*rannor(1213131),.1);
   output;
 end;
end;
run;
```

figure 10a, part 1 of clientXX.iffy.sas

```
  /* ---------------------------------------------------- */
  /* first choice - dataset to HTML                       */
  /*  formatting tool                                     */
  /* ---------------------------------------------------- */
 %macro CHOICEA;

  %ds2htm(data=test,
        runmode=s,
        openmode=replace,
        htmlfref=_webout,
        caption=this is the TEST dataset,
        ccolor=blue,
        tbbgcolr=cyan);

 %mend CHOICEA;
```

figure 10b, part 2 of clientXX.iffy.sas

```
  /* ---------------------------------------------------- */
  /* the second choice -                                  */
  /*  tabulate to HTML formatting tool                    */
  /* ---------------------------------------------------- */
%macro CHOICEB;
  %tab2htm(capture=on);
    options linesize=96 pagesize=54 nocenter
            nodate nonumber;
   title 'Example: Tabulated TEST dataset';
   proc tabulate data=WORK.TEST
    formchar='828384858687888898a8b8c'x;
    table Y   ALL , (Z W ) * ( 'MEAN' 'STD') ;
    var Z W ;
    class Y ;
   run;
  %tab2htm(capture=off,
        runmode=s,
        openmode=replace,
        htmlfref=_webout,
        brtitle=tabulated TEST dataset,
        center=Y);
%mend CHOICEB;
```

figure 10c, part 3 of clientXX.iffy.sas

```
        /* ---------------------------------------------- */
        /* this prints out an error message               */
        /* ---------------------------------------------- */
%macro OOPS;
  data _null_;
   file _webout;
   pick=symget('CHOICE');
   put 'Content-type: text/html'// 'Unknown choice:'/ pick;
  run;
%mend OOPS;
```

figure 10d, part 4 of clientXX.iffy.sas

```
  /* code selection  -  macro PICKONE invokes           */
  /* either the macro "CHOICEA" or "CHOICEB"            */

%macro PICKONE;

%IF %upcase(%superq(CHOICE))=A %THEN %DO ;
  %CHOICEA;
%END;
%ELSE %IF %upcase(%superq(CHOICE))=B %THEN %DO;
  %CHOICEB;
%END;
%ELSE %DO;
  %OOPS;
%END;

%MEND PICKONE;
%PICKONE;
```

figure 10e, part 5 of clientXX.iffy.sas

Debugging Tools

A special parameter, "*_DEBUG*" is interpreted by Broker. The value of _DEBUG is the sum of a number of powers of 2. If _DEBUG includes a "1" in the sum, then Broker will echo all of the fields sent from the client's form. If it contains a "2", Broker will send back the time.

Suppose, for example, Broker receives _DEBUG=3. Then it will echo all fields and send back the time.

Figure 11b contains a form and an associated JavaScript script which allows you to select components of the _DEBUG field with radio buttons. These buttons appear in pairs with the same field name, e.g. df2. The browser will allow only one button of each pair to be selected at a time. If you turn a parameter "on" the off button is deselected automatically.

Note that the form which sends parameters Broker must have a "Name=f" clause, and an *_DEBUG field for this script to work. Figure 11a and 11b together are an example HTML file using the _DEBUG field. The associated SAS program "W_*debug.sas" is not shown.

The JavaScript code in Figure 11b runs in the browser. Some of the JavaScript code appears inside the <SCRIPT>…</SCRIPT> pair of tags, and some appears as the value of onClick in the <INPUT type=radio … > tags.

The onClick="comp_debug()" parameters set up event handlers to be executed when the radio buttons are clicked. The function comp_debug() recomputes the value of the DEBUG parameter and then inserts it into the f.DEBUG text box.

```
<HTML>
 <HEAD>
 <TITLE>Some help debugging</TITLE>
 </HEAD>
 <BODY>
  <FORM name=f
              action='http://brokerpath/broker'>
   <INPUT     type=hidden name=_SERVICE
              value=wrkshp124>
   <INPUT     type=hidden name=_PROGRAM
              value=clientXX.W_debug.sas>
   <BR>
   <INPUT     type=text name=XYZ>
              parameter "XYZ"
   <P>
   <INPUT     type=submit
              value="send it to a SAS program">
   <HR>
   <FONT size=-2><P>
   <INPUT     type=text name=_DEBUG
              value=0> parameter "_DEBUG"
  </FORM>
```

figure11a, part 1 of W_debug.htm

```
<SCRIPT Language="JavaScript">
        // This function, together with the FORM which follows
        // sets the _DEBUG variable in the preceding form.
        // The form with _DEBUG must have a "name=f" parameter
        // in its "FORM" tag
function comp_debug(){
 with(document.dbf){
  newdb=0;
  if(_df1[1].checked)  newdb=newdb+parseInt(_df1[1].value);
  if(_df2[1].checked)  newdb=newdb+parseInt(_df2[1].value);
  if(_df4[1].checked)  newdb=newdb+parseInt(_df4[1].value);
  if(_df8[1].checked)  newdb=newdb+parseInt(_df8[1].value);
  if(_df16[1].checked) newdb=newdb+parseInt(_df16[1].value);
  if(_df128[1].checked)newdb=newdb+parseInt(_df128[1].value);
  if(_df256[1].checked)newdb=newdb+parseInt(_df256[1].value);
  if(_df512[1].checked)newdb=newdb+parseInt(_df512[1].value);
  document.f._DEBUG.value = newdb;
 }
} // ends comp_debug
</SCRIPT>

<FORM name=dbf>
<INPUT type=radio name=_df1 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df1 value=1
          onClick="comp_debug();">on  - Echo all fields.

<INPUT  type=radio   name=_df2   value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio   name=_df2   value=2
          onClick="comp_debug();">on  - Print elapsed time.

<INPUT type=radio name=_df4 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df4 value=4
          onClick="comp_debug();">on  - List definition of all services, don't
run.
<INPUT type=radio name=_df8 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df8 value=8
          onClick="comp_debug();">on  - Skip all execution processing.
<INPUT type=radio name=_df16 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df16 value=16
          onClick="comp_debug();">on  - Display output in hexadecimal.
<INPUT type=radio name=_df128 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df128 value=128
          onClick="comp_debug();">on  - Send back log file.
<INPUT type=radio name=_df256 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df256 value=256
          onClick="comp_debug();">on  - Trace socket connection attempts.
<INPUT type=radio name=_df512 value=0 checked
          onClick="comp_debug();">off
<INPUT type=radio name=_df512 value=512
          onClick="comp_debug();">on  - Show socket host and port number.
</FONT>
 </FORM>
</BODY>
</HTML>
```

figure11b, part 2 of W_debug.htm

Errors You Might See

Figure 12a contains some error messages you might see when debugging an Application Dispatcher application. The condition under which you might see the error is shown in boldface, and the error message Broker sends back is shown below that.

In example 1 the Uniform Resource Locator (URL) listed in the "action=" clause of the form tag had a typo in the directory portion of the path to Broker. You might see other messages if the typo is in the name of the server.

In example 2 the libname portion of the _PROGRAM field was misspelled.

In example 3 the program name portion of the _PROGRAM field was misspelled.

In example 4 the program type portion of the _PROGRAM field was misspelled.

In example 5 the service in the _SERVICE field is misspelled.

Example 6 happened when the SAS program failed to write anything to "_webout". This could have been due to a missing "FILE" statement, or an incorrect parameter in the "%out2html" macro.

Example 7 happened when Broker detected an incorrect HTTP header. This could be due to a typo or the lack of a null line at the end of the header.

In example 8 the "%out2html" macro contains an "htmlfile" parameter. This causes the output to go to an actual file, not the _webout fileref. The solution is to use the htmlfref parameter.

The example in figure 12b is a little different. Here the SAS program used the "&XYZ" construct in an assignment statement. When the contents of field XYZ is as in the second line of the figure, the **put 'oops'** portion of the macro variable value was executed as SAS code. This illustrates the nature of the security problem using the "&XYZ" type construct on unfiltered input. Dangerous characters can be edited out with code like that in figure 7.

1 - Bad "Action=URL"
HTTP/1.0 403 Access Forbidden (Execute Access Denied – This Virtual Directory does not allow objects to be executed.)

2 - Bad libname
Application Error
The library clientX is not allocated for the current service. Check the spelling of the library name. If it is spelled correctly contact the server administrator and notify him/her of the problem.

3 - Bad program name
Application Error
The program clientXX.field.sas does not exist.

4 - Bad Program type
Application Error
The program type 1FIELD is invalid.

5 - Bad Service
Error in HTML form
The service "wax_oy" is not listed in the configuration file.

6 - No output to _webout
Error reading SAS output
The SAS program did not produce any output. This could happen if one of the early steps failed. Set _DEBUG=131 and resubmit in order to see the SAS Log file, or set _DEBUG=16 to see a hex dump of the output.

7 - bad HTTP header
Invalid HTTP header
The SAS program did not produce a valid HTTP header. It must at least have a line like:
Content-type: text/html
followed by a blank line to define the output MIME type. "Location:" is also allowed. Set _DEBUG=131 and resubmit in order to see the SAS Log file, or set _DEBUG=18 to see a hex dump of the output.

8 - %out2htm(htmlfile=_webout,
capture=off,
window=log,
runmode=s,
openmode=replace); (you should use *htmlfref*)
Error reading SAS output
The SAS program did not produce any output. This could happen if one of the early steps failed. Set _DEBUG=131 and resubmit in order to see the SAS Log file, or set _DEBUG=16 to see a hex dump of the output.

Figure 12a, error messages you might see

Try this value of XYZ with w_debug.sas
test3";put 'oops';put"

NOTE: Capture of log output started.
oops
Field XYZ contained:
test3

Figure 12b, insecurity with "&XYZ'

Tips

Some errors in your Application Dispatcher programs are capable of stopping or locking up the Application Dispatcher SAS session. When you are developing new Application Dispatcher programs you will want to use a different service for the development.

Broker can be configured to set up a service which launches a separate SAS session. This is a good tool for initial testing, but if you will be running the application within a SAS Application Server session, you should test it under a test version of that server too.

One SAS command in particular should be avoided - the "ABORT" statement. Use some other technique to end your Dispatcher program.

Think about security. Write your SAS code in such a way that if someone writes their own HTML form they can't insert new SAS code which will execute on your server. Avoid the "&macrovar" reference form. Be careful with the "%superQ(macrovar)" construct too.

This paper has dealt with only one component of the SAS/IntrNet package. Other components may be more appropriate for a given task. The htmSQL facility, for example, offers a very simple method for invoking SQL statements on the server and embedding the results in dynamic HTML output. There are also a number of tools for using server side SAS with client side Java.

Resources and References

The best source for information on using SAS/IntrNet is the SAS Institute World Wide Web site. Click n the Web Enablement link on their home page. The home page is:

SAS Institute Inc., *SAS Home Page*. http://www.sas.com.

Other references:

Flanagan, David (1997), JavaScript The Definitive Guide. Sebastopol, CA: O'Reilly & Associates, Inc.

Grobe, Michael,
HTML quick reference
http://www.cc.ukans.edu/~acs/docs/other/HTML_quick.shtml
Academic Computing Services
The University of Kansas

Grobe, Michael ,
An instantaneous introduction to CGI scripts
and HTML forms
http://www.cc.ukans.edu/~acs/docs/other/forms-intro.shtml
Academic Computing Services
The University of Kansas

The National Center for Supercomputing Applications, *NCSA Beginner's Guide to HTML*
http://www.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimer.html

Mickey Waxman mickey@ukans.edu
Larry Hoyle mailto:l-hoyle@ukans.edu
http://www.ukans.edu/cwis/units/IPPBR

The examples from this paper can be found at:
ftp://ftp2.cc.ukans.edu/pub/ippbr/papers/mwsug98