ABSTRACT

The following paper describes a project request and tracking system that has been implemented using SAS/IntrNet software. The system allows internal clients of a team of SAS developers to request statistical reports and applications, and management to assign resources to these requests. It also provides a means for the developers to record their status on such requests. The client or management can then query project status in order to monitor their progress.

INTRODUCTION

LabOne, Inc. operates a centralized laboratory in the Kansas City Area and markets clinical, insurance and substance abuse testing services in the United States and internationally. The Information Technology Department supports clients both internal and external by providing valuable information processed using The SAS System. As a result of growth in the staff and the additional means of output delivery to the client (hard copy, email, fax, and web output), it has become increasingly important to be able to effectively deal with the logging, assignment, and tracking of incoming requests.

The decision to develop this particular product using SAS/IntrNet was due primarily to two reasons. Our organization had recently been selected to participate in a pilot telecommuting program; close monitoring of associate status while telecommuting was a key element of this program. By creating a web-based solution, we provided associates a means of working remotely but remaining accountable locally. Additionally, we felt that this would be an ideal way to evaluate the SAS/IntrNet product without impacting our clients. The application was initially internal to the information technology department; this and other SAS/IntrNet applications were only rolled out to internal and external clients after we had a good understanding of the advantages and disadvantages of the new technology.

THE APPLICATION

There are two static HTML forms that drive the application. These pages are relatively simple HTML forms created using Microsoft Word and FrontPage Express.

PROJECT REQUEST

The first form is used for entering a new project request. We have created two versions of this form - one for use within the department, and one for use outside the department. The versions are very similar, except that the internal version allows the submitter to assign resources to the project. For purposes of this paper, I will describe the internal version of the application, because all functionality is also provided in the external version. The internal project request form is replicated in Figures 1 and 2.

As you can see, a large number of input fields are displayed on this form. Because of the large number of fields on the form and the interaction between these fields it was deemed necessary to include significant error checks by SAS. Then, because the form data ultimately populates a production dataset, the application requires a visual verification of the input by the submitter before final submission is made. The SAS program that is invoked by this form, INTREQ.SAS,
named RPTDES, a single macro variable will be generated called
RPTDES. However, if two or more lines are entered, macro variables
named RPTDES1 - RPTDESn will be generated (where “n” is the
number of lines entered), plus RPTDES0 which contains the value of
“n”. The course “Running SAS Applications on the Web” discusses
this issue in depth, but the basic solution is as follows:

```sas
%global rptdes rptdes0 rptdes1;
%if %superq(rptdes0) = %then %do;
%local rptdes0 rptdes1;
%let rptdes1=%superq(rptdes);
%let rptdes0=1;
%end;
```

This will create RPTDES0 with a value of 1 and RPTDES1 with a
value the same as RPTDES. Now the macro variables are named
consistently.

Incorrect or inconsistent data from the form will generate an error
message indicating that the user should return to the form to correct
the information. Once the user completes the form correctly, the
program will generate a verification form page.

Those familiar with the SAS/IntrNet product and how the broker and
application server work together to process requests will know that
each request for the application server is performed in sequence. All user
defined macro variables and all work datasets are deleted before the next request is processed by the broker. Since we provide a view of the inputs in a browser page before final submission, this provided us with somewhat of a challenge. The values that are
input into the form must be carried through to two separate programs.
Clearly, a permanent dataset would have to be stored with the values in it. But, again by virtue of the way the broker and the app server
operate, we had to come up with a name for this dataset unique to that
user.

The broker configuration file (BROKER.CFG) converts a number of
local environment variables into SAS macro variables, which are then
available for use by the application server. One of these variables is
the IP address of the user. We use this IP address to come up with a
unique value that then becomes a permanent dataset name. This
way, only a subsequent request from the same workstation will
overwrite the values that the user has input.

```sas
data _null_;
ip1=reverse("&_rmtaddr");
ip2=scan(ip1,1,’.’);
ip3=scan(ip1,2,’.’);
ip=reverse(left(trim(ip2)) || left(trim(ip3)));
put ip;
call symput(‘ip’,ip);
run;
```

Notice that we substring from the back of the IP address. This is due
to the 8-character limitation of SAS macro variables and dataset
names. Eight characters in the forward direction of an IP address
might not be unique within our network.

Once a permanent dataset has been created, a PROC FORMS within
a call to the OUT2HTM macro will display all entered information for
final review. Submitting this form will execute the program
VERINT.SAS. This program simply confirms the request of the user,
determines the next available project number and assigns it to the
incoming project, and finally appends the new request to the
production dataset. If the internal form is used and the requester has
assigned resources, those pertinent elements are also appended to
the production dataset, DOC.TACTEST. Appendix I to this paper
shows PROC CONTENTS output of this dataset, indicating the type
of information that is being maintained. Notice that the engine for this
dataset is identified as "REMOTE". The permanent dataset actually
resides on an ALPHA/VMS machine and we access it through the use
of a SAS/SHARE server remotely.

Another, newer, feature of this portion of the application is to
generate automated emails to the group management
indicating that a new project request has been made. If the
user has assigned resources to the request, the email will
notify that individual that a new request has been assigned
to them. Although we are using an internal automated email
facility to perform this, the SAS email functionality could easily
be substituted.

**PROJECT QUERY**

The second piece of the application provides a means of allowing developers within our group to update the status of projects
that they are working on. It also allows developers within our group and requesters of reports from other
departments to query the dataset to monitor the status of
these projects. Again, there are two versions of the HTML
form, for interdepartmental and external users. The internal
version provides information that our external users do not
need access to, and also provides the functionality to update
status as the project moves through its development cycle.

![Figure 3: Internal Project Query Form](http://example.com/image.png)

The form allows users to query in one of two ways. They
can either input a valid project number, or they can query
the entire dataset based upon line of business, department,
and project status. Selection of the sort criteria is also
provided. Submission of the form executes the SAS
program QRYINT.SAS. The output of this program is driven
by a number of conditions including user inputs to the
project request form and to the status of the queried
projects. This makes it perhaps the most complicated of
the programs that make up this application.

If the user chooses to query by project number, the program
will return a web page with three basic components. The
first is a DS2HTM output listing some of the pertinent values
from the dataset. The second component is a PROC
FORMS within a call to OUT2HTM that displays the project
description, which you will remember can be up to 20 lines
long. Finally, a form is displayed in which the developer can
update the status of the project. Depending on where in the development life cycle the project is, the form is customized to accept new information that is germane to that step of the development.

If, on the other hand, the user chooses not to query by project number, the program will return a web page with only the DS2HTM output listing dataset values. Notice, however, that now project numbers that match the criteria the user has selected are displayed and are hyperlinks.

Clicking one of these hyperlinks will execute PDINT.SAS, which will generate the detailed page exactly as shown in Figure 4 for the selected project number.

In either of the above situations, clicking “Submit Database Update” will execute QCLOG.SAS, which will update the permanent dataset based to reflect the status changes that the user has made, and display an HTML page advising the user that the update has been made. Finally, appropriate email notifications will be sent out as well.

**POTENTIAL ENHANCEMENTS**

The SAS/IntrNet Project Request and Tracking Application was the first attempt at implementing web technology using SAS at LabOne. We have learned quite a bit since this application was developed, and some ideas for improvements have surfaced as other applications were developed:

1. **Use of JavaScript** - As previously noted, this application relies heavily on validation of HTML form fields, and oftentimes validation is based upon the values of other fields on that page. Significant performance enhancement could be achieved by doing these validations locally using JavaScript rather than depending on a remote call to SAS to perform them.

2. **HTML Formatting Macros** - There have been some enhancements to the HTML formatting macros that have been introduced since we developed this application that we can likely exploit (style sheets, etc.). There are some potential improvements to readability and usability of the static and dynamic HTML that could be implemented.

3. **Performance Issues** - The application has faced some performance issues as a result of our reliance on remote data. There are some significant advantages to retaining this data on the ALPHA machine, and we will likely have a number of other applications accessing remote data as our intranet strategy is rolled out. Therefore, we are assessing and evaluating options for improving our network performance.

**CONCLUSION**

SAS/IntrNet software has enabled us to effectively roll out a project request and tracking application that aids us in a number of ways.

Firstly, we have introduced a standardized means for our internal customers to request statistical reports and applications of our organization. This has reduced our reliance on administrative manpower by automating the collection of such requests. This has also made the information that we receive in order to process more useful by automating the validation of these requests, reducing the need for follow up with the customer for clarification.

Finally, we have provided a mechanism for these internal customers to prioritize their own requests; to track our progress on these requests; and to be more aware of the other projects which they and others have requested of us which could impact our delivery time.

**REFERENCES**


**ACKNOWLEDGMENTS**

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CONTACT INFORMATION
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Email: steve.beakley@labone.com
## Appendix I: Contents Listing of Projects Dataset (DOC.TACTEST)

Data Set Name: DOC.TACTEST  
Observations: 1286  
Member Type: DATA  
Variables: 71  
Engine: REMOTE  
Indexes: 0  
Created: 20:17 Wednesday, January 20, 1999  
Observation Length: 2603  
Last Modified: 20:18 Wednesday, January 20, 1999  
Deleted Observations: 0  
Protection:  
Compressed: NO  
Data Set Type:  
Label:  

-----Engine/Host Dependent Information-----

Data Set Page Size: 31744  
Number of Data Set Pages: 108  
File Format: 607  
First Data Page: 1  
Max Obs per Page: 12  
Obs in First Data Page: 8  
Filename: SAS$DRA0:[SAS_DOC]TACTEST.SASEB$DATA  
Host Format: AXP  
Disk Blocks Allocated: 6708  

-----Alphabetic List of Variables and Attributes-----

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