Paper 197

Project Request and Tracking Using SAS/IntrNet™ Software

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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

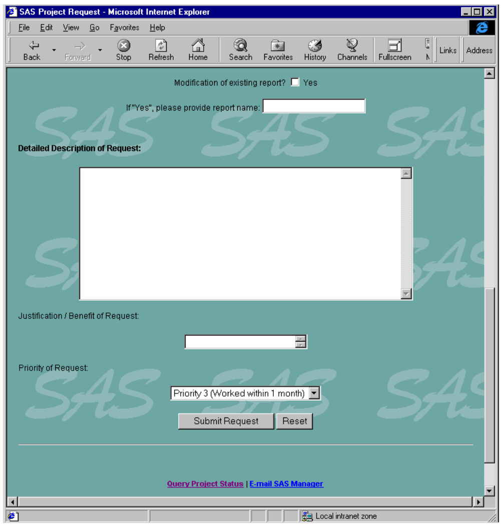
LabOne, Inc. operates a centralized laboratory in the Kansas City Area and markets clinical, insurance and substance abuse testing services in the United States and internationally. The Information Technology Department supports clients both internal and external by providing valuable information processed 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


SAS Project Request - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Links Address
Local intranet zone

Modification of existing report? ☐ Yes

If "Yes", please provide report name:

Detailed Description of Request:

Justification / Benefit of Request:

Priority of Request:

Priority 3 (Worked within 1 month)

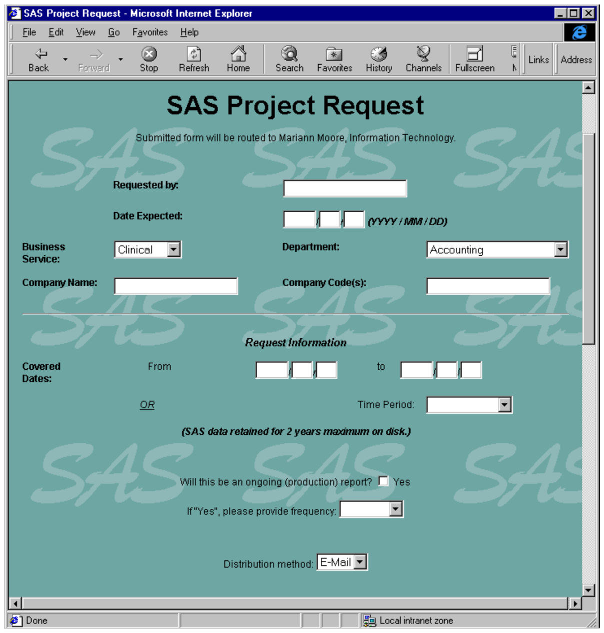
Submit Request | Reset

Query Project Status | E-mail SAS Manager

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,

Figure 1: Internal Project Request Form (Part 1)


SAS Project Request - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Links Address
Done
Local intranet zone

SAS Project Request

Submitted form will be routed to Mariann Moore, Information Technology.

Requested by:

Date Expected: / / *(YYYY / MM / DD)*

Business Service: Clinical **Department:** Accounting

Company Name: **Company Code(s):**

Request Information

Covered Dates: From / / to / /

OR Time Period:

(SAS data retained for 2 years maximum on disk.)

Will this be an ongoing (production) report? ☐ Yes

If "Yes", please provide frequency:

Distribution method: E-Mail

Figure 2: Internal Project Request Form (Part 2)

performs these steps. The program begins by creating a temporary dataset that stores the values from the various form inputs including text boxes, radio buttons, check boxes, and drop down menus. (Those familiar with the operation of SAS/IntrNet will remember that it is good practice to use %SUPERQ when referencing macro variables. This will eliminate the risk of unexpected characters being passed to a SAS session from the HTML form.)

One of the elements on the HTML form deserves particular attention. The element for the project description is a scrolling or multi-line text box, which presents a specific problem when using SAS/IntrNet. Depending on how many lines are entered in the text box, either one or many macro variables will be passed by the broker to the application server. For example, if one line is entered into a text box 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:

```
%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 are aware that each request of the application server by the broker 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.

```
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;
```

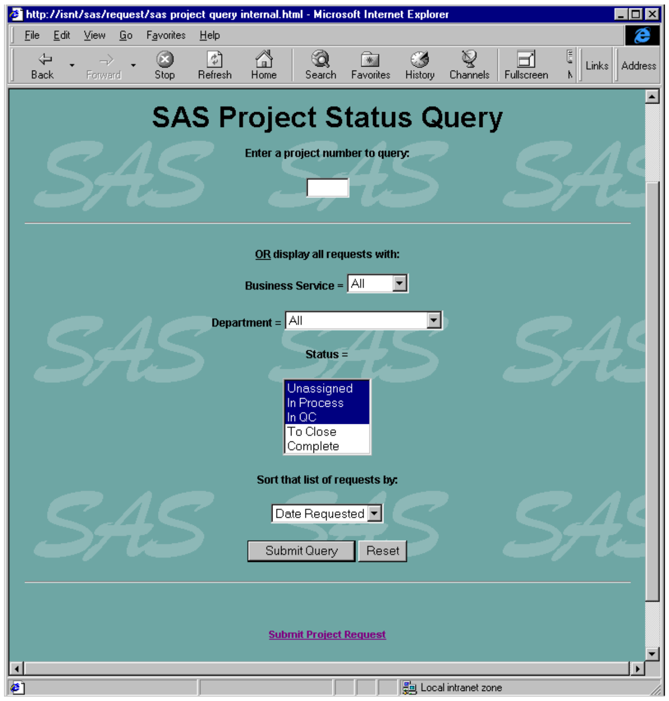
Notice that we substring from the back of the IP address. This is due to the 8-character limitation of SAS macro variables and dataset names. Eight characters in the forward direction of an IP address might not be unique within our network.

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.


http://isnt/sas/request/sas project query internal.html - Microsoft Internet Explorer

SAS Project Status Query

Enter a project number to query:

OR display all requests with:

Business Service = All

Department = All

Status =

Unassigned
In Process
In QC
To Close
Complete

Sort that list of requests by:

Date Requested

Submit Query | Reset

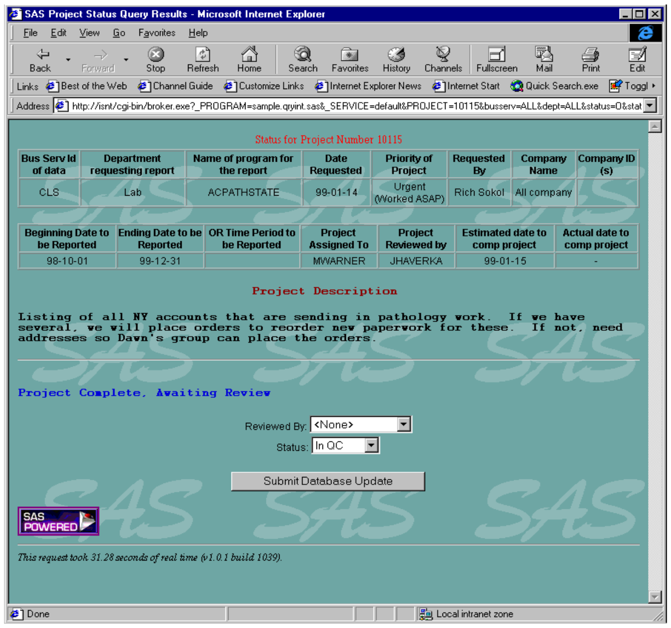
Submit Project Request

File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Links Address
Local intranet zone

Figure 3: Internal Project Query Form

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.


SAS Project Status Query Results - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit
Links Best of the Web Channel Guide Customize Links Internet Explorer News Internet Start Quick Search.exe Toggl
Address
SAS POWERED
Done
Local intranet zone

http://isnt/cgi-bin/broker.exe?_PROGRAM=sample.qryint.sas&_SERVICE=default&PROJECT=10115&busserv=ALL&dept=ALL&status=0&stat

Status for Project Number 10115

Bus Serv Id of data	Department requesting report	Name of program for the report	Date Requested	Priority of Project	Requested By	Company Name	Company ID (s)
CLS	Lab	ACPATHSTATE	99-01-14	Urgent (Worked ASAP)	Rich Sokol	All company	

Beginning Date to be Reported	Ending Date to be Reported	OR Time Period to be Reported	Project Assigned To	Project Reviewed by	Estimated date to comp project	Actual date to comp project
98-10-01	99-12-31		MWARNER	JHAVERKA	99-01-15	-

Project Description

Listing of all NY accounts that are sending in pathology work. If we have several, we will place orders to reorder new paperwork for these. If not, need addresses so Dawn's group can place the orders.

Project Complete, Awaiting Review

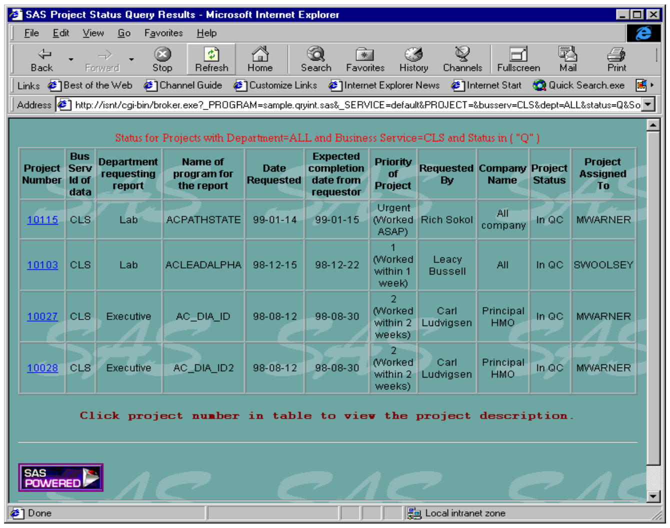
Reviewed By: <None>
Status: In QC

Submit Database Update

This request took 31.28 seconds of real time (v1.0.1 build 1039).

Figure 4: Query Results from Option 1

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.


SAS Project Status Query Results - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print
Links Best of the Web Channel Guide Customize Links Internet Explorer News Internet Start Quick Search.exe
Address
SAS POWERED
Done
Local intranet zone

http://isnt/cgi-bin/broker.exe?_PROGRAM=sample.qryint.sas&_SERVICE=default&PROJECT=&busserv=CLS&dept=ALL&status=Q&So

Status for Projects with Department=ALL and Business Service=CLS and Status in ("Q")

Project Number	Bus Serv Id of data	Department requesting report	Name of program for the report	Date Requested	Expected completion date from requestor	Priority of Project	Requested By	Company Name	Project Status	Project Assigned To
10115	CLS	Lab	ACPATHSTATE	99-01-14	99-01-15	Urgent (Worked ASAP)	Rich Sokol	All company	In QC	MWARNER
10103	CLS	Lab	ACLEADALPHA	98-12-15	98-12-22	1 (Worked within 1 week)	Leacy Bussell	All	In QC	SWOOLSEY
10027	CLS	Executive	AC_DIA_ID	98-08-12	98-08-30	2 (Worked within 2 weeks)	Carl Ludvigsen	Principal HMO	In QC	MWARNER
10028	CLS	Executive	AC_DIA_ID2	98-08-12	98-08-30	2 (Worked within 2 weeks)	Carl Ludvigsen	Principal HMO	In QC	MWARNER

Click project number in table to view the project description.

Figure 5: Query Results from Option 2

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

SAS Institute Inc. (1997). *Running SAS Applications on the Web - Course Notes*, Cary, NC: SAS Institute Inc.

ACKNOWLEDGMENTS

SAS, SAS/IntrNet, and SAS/SHARE are registered trademarks of SAS Institute Inc. ® indicates USA registration.

CONTACT INFORMATION

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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:                                                Sorted:               NO
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-----

 #    Variable    Type    Len     Pos    Format      Informat    Label

21    ACTDATE     Num       8     210    YYMMDD8.    YYMMDD8.    Actual date to comp project
19    ACTTIME     Num       8     194                6.2         Actual time to comp project
60    ALLCOMP     Char      1    2302
27    ANALYST     Char      3     289                            Initials of programmer writing report
66    APRVBY      Char      8    2322
64    ASNDATE     Num       8    2306
 4    ASSIGNTO    Char      8      41                            Project Assigned To
51    BEGDATE     Num       8    2274    YYMMDD8.    YYMMDD8.    Beginning Date to be Reported
 7    BUSID       Char      3      61                            Bus Serv Id of data
 1    COMPID      Char     20       0                            Company ID(s)
23    CONAME      Char     25     219                            Company Name
25    CONTACT     Char     15     259
28    DATECLSD    Num       8     292    YYMMDD8.    YYMMDD8.    Date program was closed out
 5    DEPT        Char      4      49                            Department requesting report
30    DESC1       Char    200     306
 |    |           |         |       |
49    DESC20      Char     80    2186
63    DIRCLN      Char      1    2305
54    DISTMETH    Char      6    2291
62    DOCUPD      Char      1    2304
50    DTEREQD     Num       8    2266    YYMMDD8.    YYMMDD8.    Date Requested
52    ENDDATE     Num       8    2282    YYMMDD8.    YYMMDD8.    Ending Date to be Reported
70    ENDNUM      Num       8    2587
20    ESTDATE     Num       8     202    YYMMDD8.    YYMMDD8.    Estimated date to comp project
18    ESTTIME     Num       8     186                6.2         Estimated time to comp project
17    EXPCOMP     Num       8     178    YYMMDD8.    YYMMDD8.    Expected completion date from requestor
58    EXTRPT      Char      1    2300
53    FREQ        Char      1    2290
56    JUST        Char      1    2298
61    LABTTL      Char      1    2303
71    LAST        Num       8    2595
59    MULTCOMP    Char      1    2301
68    ODISTMTH    Char    127    2452
67    OTIMEPER    Char    122    2330
 3    PFLAG       Char      1      40
10    PHASE       Num       5      72    4.          4.          Phase of project
11    PHASEDES    Char     30      77                            Description of phase
16    PRIORITY    Char      1     177                            Priority of Project
57    PRODRPT     Char      1    2299
26    PROGRAM     Char     15     274                            Name of program for the report
 9    PROJECT     Num       5      67    5.          5.          Sequential # Based on dept requesting
29    REPMAINT    Char      6     300
55    REPNAME     Char      1    2297
 6    REQDATE     Num       8      53    YYMMDD8.    YYMMDD8.    Date requested
24    REQDBY      Char     15     244                            Requested By
65    REVDBY      Char      8    2314                            Project Reviewed by
69    STARTNUM    Num       8    2579
22    STATUS      Char      1     218                            Project Status
14    STEP        Num       5     142    4.          4.          Step of project (if necessary)
15    STEPDES     Char     30     147                            Description of step
12    TASK        Num       5     107    4.          4.          Task of project (if necessary)
13    TASKDES     Char     30     112                            Desciption of task
 2    TIMEPER     Char     20      20                            OR Time Period to be Reported
 8    TYPE        Char      3      64                            Type of request (CLT,INH)
```