

Information System for State Trauma Advisory Committee

– An application of SAS/IntrNet

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ABSTRACT

The North Carolina Trauma Registry collects data from the trauma centers and hospitals in North Carolina, and generates reports for State Trauma Advisory Committee and individual hospitals. In order to provide an easy to use, efficient, and secure system, the registry now is developing the Information System for State Trauma Advisory Council (ISSAC). We have used SAS/IntrNet and base SAS to develop an online system for data collection and reporting. The Application Dispatcher component of SAS/IntrNet allows a client to run a SAS program on demand and get the results to the browser. Due to sensitivity of the data and the concern of HIPAA, development of a secure system is our highest priority. The security system includes user authentication, and a log file that records the user's identification, date and time, and page visited. This paper covers the implementation of security and data reporting.

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INTRODUCTION

The ISSAC will be divided into two parts – Data Warehouse Generation (which includes data submission, de-identification, and updating of the data warehouse), and Data Reporting. This paper covers the data reporting. ISSAC is designed to provide trauma system performance improvement information to the North Carolina Regional Advisory Committees, which are made up of hospitals and EMS agencies that cooperate to provide trauma care for a region.

USER AUTHENTICATION

The purpose of user authentication is to validate the identity of the different users. There are two goals of validation: 1. System Authority: determine if the user is allowed to access ISSAC; 2. Report Authority: determine which hospital(s) or RAC(s) data the user may view through the report.

There are two different categories of users of ISSAC, system administrator and general user. For a general user, data viewed in each report are either specific to the hospital that the user has permission to see data for, or the data are aggregated across all hospitals in their RAC.

The first page that the user sees upon starting ISSAC is the login page (Figure 1).

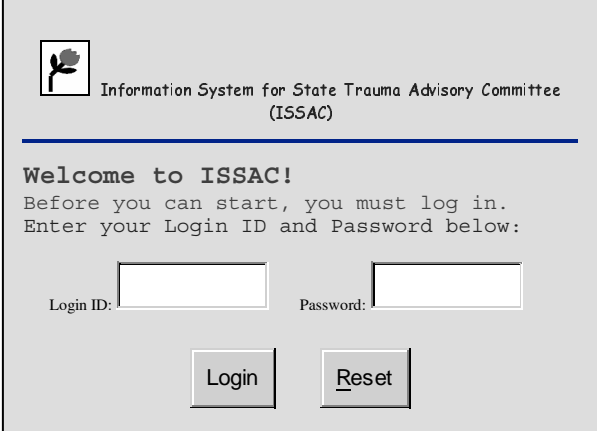


Figure 1. Login Page

Part of the code to generate the login page is shown below.

```
<FORM method="post" ACTION="/cgi-bin/broker.exe" ALIGN="center">
<INPUT ALIGN="center" TYPE="hidden"
NAME="_service" VALUE="default" >
<INPUT align="center" TYPE="hidden"
NAME="_program" VALUE="issac.main.sas">
<P ALIGN=center> <FONT FACE="Courier
New">Login ID: <INPUT SIZE=12
NAME="loginid"></P>
<P ALIGN=center> <FONT FACE="Courier New">
Password:
<INPUT SIZE=12 TYPE="password"
NAME="password"></P>
<P ALIGN=center> <INPUT TYPE="SUBMIT"
VALUE="Login"></P>
</FORM>
```

Due to the sensitivity of the medical information in ISSAC and the requirement to follow the HIPAA (Health Insurance Portability & Accountability Act) regulations, development of a secure system is our highest priority.

We use the following methods to implement the security.

1. Database access control model to implement user authentication of ISSAC.

A lookup table – *login_table* is used to store user information. It contains four columns: ID, type, password, and hospitals. Unsuccessful login will result in the display of a Login screen with an error message: *Login ID or password is incorrect. Try again* (Figure 2).

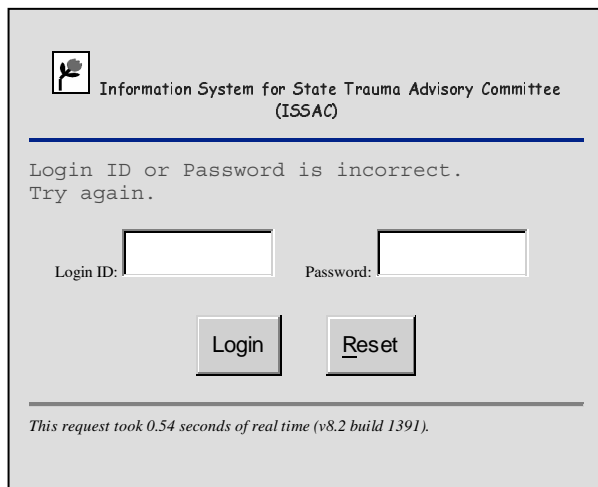


Figure 2. Unsuccessful Login Page

If the ID and password match the information in the *login_table*, the ISSAC Organization Selection page will be displayed. This page includes a list of hospitals and RACs for which the user has permission to view data. The user clicks on a hospital or RAC name to select the organization whose data the user wishes to see. Figure 3a and Figure 3b show the sample Organization Selection pages for an administrator and a general user.

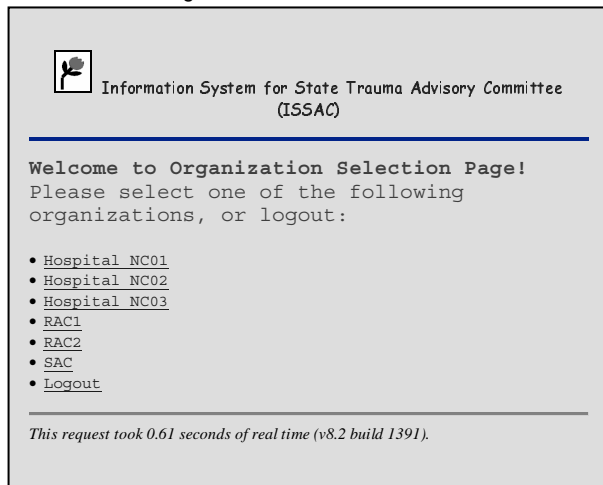


Figure 3a. Organization Selection Page for an Administrator

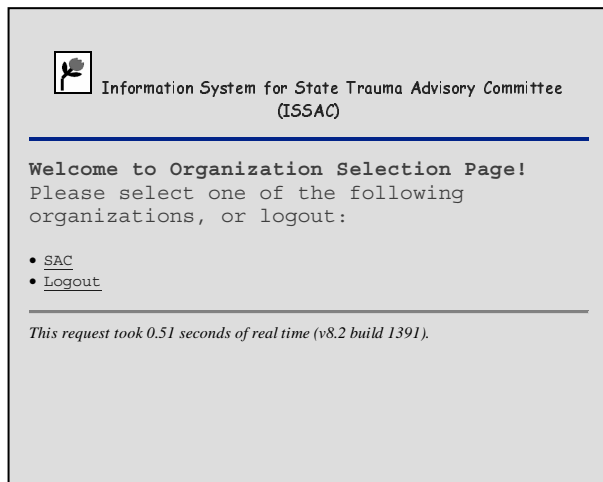


Figure 3b. Organization Selection Page for a general user

2. Log file to record the user's identification, login time, and page visited.

```
DATA pwdata.weblog;
LENGTH UserID $200 Link $ 200 Report $200;
  LogDate = DATE();
  LogTime = TIME();
  Link = "login page";
  FORMAT LogDate MMDDYY8.;
  FORMAT LogTime TIME8.;
RUN;
```

3. Hide user and password information in the web page address bar using POST method instead of GET method.

```
<FORM method="post" ACTION="/cgi-bin/broker.exe" ALIGN="center">
```

There are two methods to submit a form in HTML, GET and POST. GET will display all the parameter values: `http://.../cgi-bin/broker.exe?service=default&_program=issac.main.sas&loginid=administrator&password=sas`; POST will hide all of this information: `http://.../cgi-bin/broker.exe`

DATA REPORTING

The reports provided through the ISSAC web page will provide the hospital with summary statistics of the ISSAC data.

As shown in Figure 3a and 3b, after successfully logging in to ISSAC, an administrator can select all the organizations, while a general user can choose only from selected hospital, RAC, or SAC (State Advisory Committee). If a user is affiliated with hospital NC01, then she/he can select hospital NC01 and the SAC. This page is dynamically built. Part of the code is shown below.

```
%MACRO ISSAC_main;
%IF %sysfunc (libref(SAVE)) %THEN %DO;
%IF &loginid=admin AND &password=&adminpw
%THEN %LET IDCHECK=PASSED;
%ELSE %IF &loginid=userab AND
&password=&userabpw %THEN %LET
IDCHECK=&abtype;
... ..
%ELSE %IF &loginid=general AND
&password=&usergenpw %THEN %LET
IDCHECK=&gentype;
%ELSE %LET IDCHECK=FAILED;
%IF &IDCHECK=FAILED %THEN %DO
DATA _null_;
FILE _webout;
PUT '<HTML>';
PUT '<HEAD><TITLE>Invalid
Login</TITLE></HEAD>';
PUT '<BODY vlink="#004488" link="#0066AA"
bgcolor="#E0E0E0">';
PUT '<h1 align="left">
<font size="5" face="Comic Sans MS"
color="#002288">Information System for State
Trauma Advisory Committee (ISSAC)</font></h1>';
PUT '<hr align="center" width="100%"
color="#002288" noShade SIZE="2">';
PUT '<P align="center"><b><font size ="4"
color="red" face="Courier New">Login ID or
Password is incorrect. Try
again.</font></b></P>';
PUT '<FORM method="Post" ACTION="' &_url ' '
align="center">';
PUT '<INPUT align="center" TYPE="HIDDEN"
NAME="_service" VALUE=" ' &_service ' ' >';
```

```

PUT '<INPUT align="center" TYPE="HIDDEN"
NAME="_program" VALUE="' &_pgmlib"
'.issac_main.sas">';
PUT '<p align="center" <font face="Courier
New">Login ID: <INPUT SIZE=12
NAME="loginid"></P>';
PUT '<p align="center" <font face="Courier
New">Password: <INPUT SIZE=12 TYPE="password"
NAME="password"></P>';
PUT '<p align="center" <INPUT TYPE="SUBMIT"
VALUE="Login">';
PUT '<INPUT TYPE="RESET" VALUE="Reset"></p>';
PUT '</FORM>';
PUT '</BODY>';
PUT '</HTML>';
RUN;
%END;
%ELSE %DO;

/* Validation successful - create session and
save login ID. */
%LET rc=%sysfunc(appsrv_session(create));
%global SAVE_LOGINID;
%LET SAVE_LOGINID=&loginid
%END;
%END;
%ELSE %LET IDCHECK=PASSED; /* Assume valid
login if session already exists. */
%IF &IDCHECK eq PASSED %THEN %DO;
DATA _null_;
FILE _webout;
PUT '<HTML>';
PUT '<HEAD><TITLE>Organization
Selection</TITLE></HEAD>';
PUT;
PUT '<BODY vlink="#004488" link="#0066AA"
bgcolor="#E0E0E0">';
PUT '<h1 align="left">
<font size="5" face="Comic Sans MS"
color="#002288">Information System for State
Trauma Trauma Advisory Committee
(ISSAC)</font></h1>';
PUT '<hr align="center" width="100%"
color="#002288" noShade SIZE="2">';
PUT '<p><b><font size="4" color="#002288"
face="Courier New"> Welcome to Organization
Selection Page! </font></b></p>';
PUT '<p><font size="3" color="#002288"
face="Courier New"> Please select one of the
following organizations, or
logout:</font></p>';
PUT;
length hrefroot $400;
hrefroot = "%superq(_THISSESSION)" ||
'_&_PROGRAM=' || '&_PGMLIB";
put '<LI><A HREF="' hrefroot +(-1)
... ..
put '<LI><A HREF="' hrefroot +(-1)
'.ISSAC_logout.sas"><font face = "Courier
New">Logout</font></A></LI>';
put '</BODY>';
put '</HTML>';
run;
%END;

```

After selecting the organization, a report selection page is shown (Figure 4).

Figure 4. Report Selection Page

The Report Selection page allows a user to select different reports from three scroll-down windows.

1. Demographics Reports for Whole Dataset
2. Demographics Reports for the Current Year
3. Procedure Report

Part of code for the scroll-down window is shown below.

```

PUT '<table ALIGH="CENTER">';
PUT '<tr align="middle">';
PUT '<caption><select multiple name="choice"
size="8">';
PUT '<option value="ED_LOS/NOCUM">1.
Frequency of ED length of stay (LOS) ';
PUT '<in hours</option>';

```

```

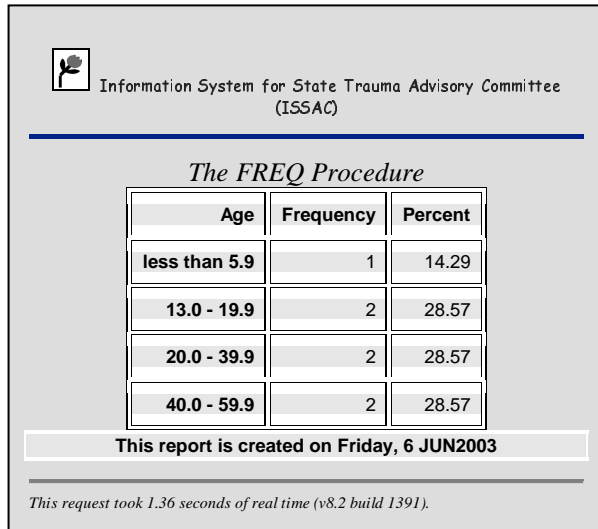
PUT '<option value="AGE/NOCUM">2. Age
Distribution</option>';
PUT '<option value="Age * ED_LOS/NOROW NOCOL
NOPERCENT ">3. Age ';
... ..
PUT '</select> </caption>';
PUT '</tr>';
PUT '<tr align="middle">';
PUT '<td><br>';
PUT '<input type="submit"
value="Submit"></td>';
PUT '</tr>';
PUT '</table>';

```

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After selecting the report, the report is generated dynamically, and displayed. (Figure 5).



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Figure 5. Sample Report

CONCLUSION

With the wide use of the internet, the World Wide Web has become an efficient way to view information. SAS/IntrNet is a powerful tool to enable the web-base application. The web interface to ISSAC was developed to provide an easy to use and secure system for State Trauma Advisory Committee and individual hospitals to get the information needed for trauma system performance improvement activities.

REFERENCES

SAS Institute Inc. <<http://support.sas.com/rnd/web/intnet/>>

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CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the authors at: