Displaying Information from Mainframe SAS® Libraries on Your Intranet

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Intranets are being used by many companies to deliver private corporate information to internal users. Many organizations have already found that internal Intranets can help empower their employees through more timely and less costly information flow. At Statistics Canada the Informatics Branch is utilizing the Intranet technology to communicate with its clients and provide them with up to date information on its services and rates. This paper describes our fully automated process for summarizing data on the mainframe and storing the graphical result in a Web page on our Intranet.

Introduction

This paper documents an example of a fully automated process to display numeric data from a SAS library on our mainframe as a graphic in a Web page on our Intranet. We start with mainframe data, move it to a PC to generate the graph, then store the graphic on a Web server where it is accessed by our clients.

We have found SAS 6.11 to be a convenient tool for producing the GIF format files commonly used in Web applications. The feature is not available in the mainframe version, so the data must be transferred to a PC or server for GIF creation. It is unlikely that you will cost justify a properly licensed copy of SAS on your Web server just for GIF production, so you too will probably follow our example of using a PC as an interim measure.

The Internal Web (Intranet)

An intranet is any internal network (LAN or WAN) that supports Internet applications, primarily web (hypertext transfer protocol), but also other applications such as FTP (file transfer protocol). Typically, your network must have TCP/IP connectivity before an intranet will be possible. If your network has TCP/IP, you can easily install web servers and browsers that work the same way they do on the World-Wide Web.

Every major company has information that it must distribute to internal employees or external customers and suppliers. This technology gives us a way to put this information on-line for instantaneous access by authorized users. Intranets dramatically reduce the cost and time of content development, duplication, distribution and usage. The basic procedure is:

- creation of content
- migration of content to Intranet environment

Extract and Summarize Data

For our example, CPU usage information has been derived from the MVS's System Management Facilities (SMF) data and stored in the SAS data library "ann" as part of a production application. The dataset "usagcpu" contains one observation per service per day.

The following SAS code extracts data for the last 31 days from ann.usagcpu, collapses the services into *Batch, TSO* and *Other,* summarizes the data by *service* within *execdate,* sums the variable *msu (mainframe service unit)* and creates a SAS transport file.

```
libname ann 'cars.data.ann9697.sas' disp=shr;
filename cpucport 'cars.aa.cport.text';

/* Extract data for the last 31 days from usagcpu data set */
data cpudays (keep=execdate service msu);
  format sdate edate execdate date7.;
  retain sdate edate;
  set ann.usagcpu;
  if _n_ =1 then do;
    sdate=date()-31;
    edate=date()-1;
    end;
/* Select last 31 days */
if execdate >=sdate and execdate <=edate;
select (substr(service,1,1));
    when('B') service='B'; /* Batch */
    when('T') service='T';  /*  TSO */
    otherwise service='O';  /* Other services */
end;

/* Summarize the data by service within execdate */
/* and sum variable msu  */
proc summary data=cpudays nway missing;
  class execdate service;
  var msu;
  output out=cpusum (drop= _freq_ _type_) sum=;

/* Export cpusum to the transport file */
proc cport data=cpusum file=cpucport;
run;
```

Moving data from MVS to the PC

In most installations, there will be several alternative ways to accomplish this function. We chose to use a SAS transport file and FTP to move it because of elaborate security procedures for accessing our mainframe. The side benefit is that it cleanly breaks the application into pieces such that we can rerun or replace at will. If SAS was available on our Web server, we could avoid using a PC. The process is run in batch and submitted by the mainframe job scheduling system.

Here is the JCL and FTP command stream to logon to the PC and transfer 'cars.aa.cport.text':

```
//MAINTOPC JOB (0165,MN06,,2),USERID
//*
//* Phase 1 Step 1 - FTP transport file to the PC
//*
//P1S1   EXEC PGM=FTP
//SYSPRINT DD SYSOUT=*
//OUTPUT   DD SYSOUT=*
//INPUT    DD *
PCname
userid
password
binary
put 'cars.aa.cport.text' d:\intranet\cpucport.txt
QUIT
//*
```

Processing on the PC

The PC processing may be done in the traditional interactive style or automated as shown in the next section of this paper. SAS code running on the PC imports the transport file back to a SAS data set and produces a vertical bar chart that shows the usage of *Batch, Tso(Interactive)* and *Other* services for each of the last 31 days. The chart is stored in 'usagcpu.gif' which will be moved to the Web server. The SAS code shown below is stored in 'd:\intranet\usagcpu.sas'.

```
filename cpucport 'd:\intranet\cpucport.txt';
libname intranet 'd:\intranet\';

/* Import the transport file to a SAS data set */
proc cimport data=intranet.usagcpu
               infile=cpucport;

data intranet.usagcpu;
  format msu 10.;
  set intranet.usagcpu;
  msu = msu / 1000;

/* Run proc gchart to produce a vertical bar chart */
/* and store it in usagcpu.gif                     */
goptions device=imggif
        gaccess='sasgastd>d:\intranet\usagcpu.gif';
axis1 label=(j=l
              f=swiss
              h=1.75
              j=r 'MSUs'
              j=r '(in thousands)')
              length=18
              minor=none
```

```
              order=(0 to 900 by 100)
              value=(f=swiss h=1.25);

axis2 label=(j=c
              f=swiss
              h=1.5 'Date')
              length=60
              minor=none
              value=(h=1);

title f=swiss
     h=2 'Mainframe CPU Usage';

pattern1   value=solid
              color=green;
pattern2   value=solid
              color=red;
pattern3   value=solid
              color=blue;

legend1 cborder=red
              label=none
              value=(h=1.5 f=swiss 'Batch' 'Interactive' 'Other')
              shape=bar(1.75,1.25);

proc gchart data=intranet.usagcpu;
     vbar execdate /type=sum
          caxis=red
          maxis=axis2
          raxis=axis1
          space=1
          discrete
          noheading
          sumvar=msu
          subgroup=service
          legend=legend1;
     run;
quit;

/* Transfer the GIF to the Web server */
x 'c:\winnt\system32\ftp.exe -v -i -s:d:\intranet\ftpin.txt';
endsas;
```

The second last line above uses the following set of FTP commands in 'd:\intranet\ftpin.txt', to logon and transfer the 'usagcpu.gif' to our Intranet environment replacing previous day's chart:

```
open intrenvr
userid
password
cd dir
put d:\intranet\usagcpu.gif usagcpu.gif
close
quit
```

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Automating the daily process on the PC

The SMF data is dumped at 01:00 a.m. every night. The processing of the data, updating of the files and FTP'ing the transport file to the PC generally completes around 02:00 a.m. Processing on the PC has to be done sometime after that.

Our environment is SAS 6.11 running under Windows NT 3.51. We have a job scheduler that would start SAS at a fixed time each day. This utility is called KickOff and it comes with WordPerfect 6.0. KickOff initiates jobs according to user defined events.
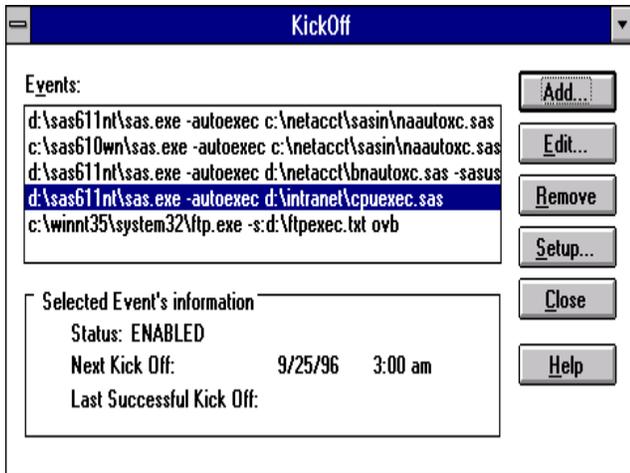
KickOff utility

Clicking on <<Add>> or <<Edit>> buttons, opens the KickOff Edit / Add window.
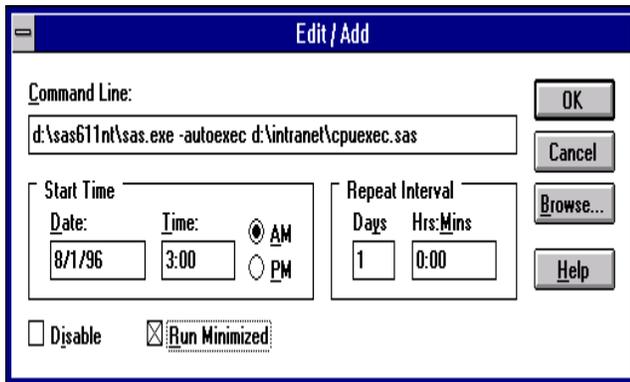
The command to start SAS and execute the daily job is entered on the command line:

```
d:\sas611nt\sas.exe -autoexec
d:\intranet\cpuexec.sas
```

The time is set to 03:00 a.m. and Days in Repeat Interval is set to 1 to enable the daily job to run at 03:00 a.m., everyday.

The program code shown in the section "Processing on the PC" is stored in 'd:\intranet\usagcpu.sas', where it will be referenced by the daily processing. The SAS autoexec file needed to include the daily job for execution is cpuexec.sas:

```
/******* Autoexec file *******/
filename sasin 'd:\intranet\';
%include sasin(usagcpu.sas);
```

Security Considerations

Leaving a work-station powered up and running overnight in an office environment has security problems of its own. One way to minimize the problem is to use a password protected screen saver. To do this select the Desktop icon in the Control Panel, you will see the following window:
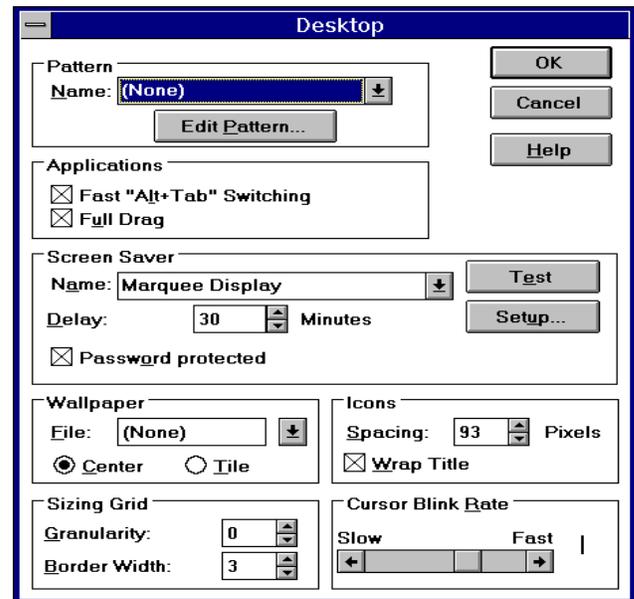
From Screen Saver list, select Marquee Display. This will open up a window to define message text, font, color, etc. Select an appropriate text to prevent a co-worker from accidentally powering your work-station off. To lock the computer against un-authorized access, select the "Password protected" button in the Desktop window. Under Windows NT your password to logon to the computer is taken automatically.

The Web Technology

If you have done much browsing on the World-Wide Web, you already understand the power of the web browser for retrieving wide varieties of information over public networks. The main mechanism for formatting and displaying documents in a web browser is a markup language called Hypertext Markup Language (HTML).

Web browsers can display HTML text, unformatted text and GIF or JPEG format images. Computer reports traditionally printed on paper may be distributed by simply printing them to a file which is migrated to a Web server and hyper-linked from other pages for viewing by employees and managers.
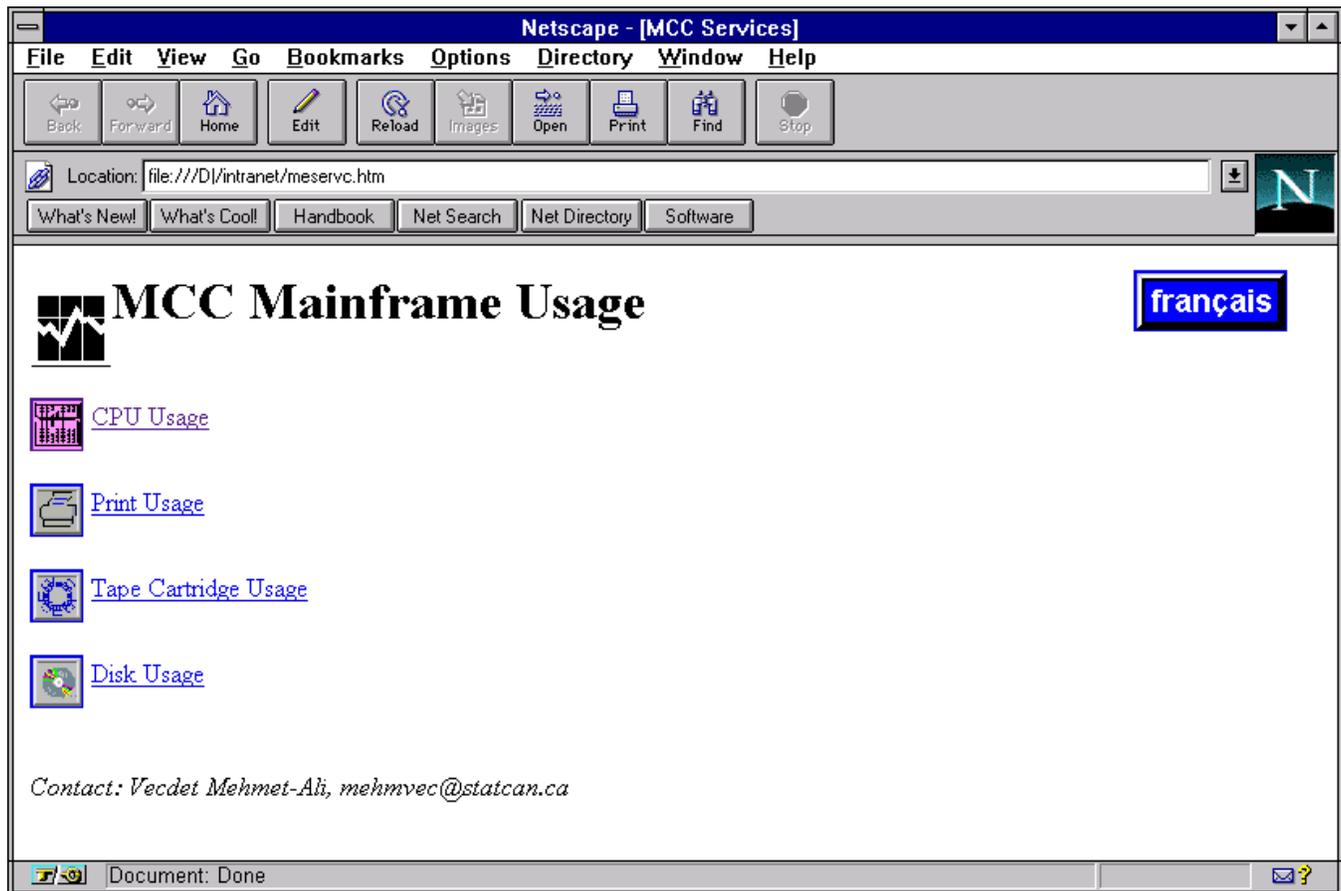
Mainframe Usage page on Statistics Canada Intranet

The HTML source of the above page is:

```
<html>
<head>
<A HREF="mfservc.html"><IMG ALT="[Français]" ALIGN=right SRC="btnf-blw.gif"></A>
<title>MCC Services</title>
</head>
<body>
<h1><img src="s_statgr.gif" border=0 height=60 width=50align=center>MCC Mainframe Usage </h1>
<p><a href="usagcpu.htm"><img src="abacus.gif" border=2 height=30 width=30align=center></a>
    <a href="usagcpu.htm">CPU Usage</a></p>
<p><a href="usagprnt.htm"><img src="bprinter.gif" border=2 height=30 width=30align=center></a>
    <a href="usagprnt.htm">Print Usage</a></p>
<p><a href="usagtape.htm"><img src="bcartsil.gif" border=2 height=30 width=30align=center></a>
    <a href="usagtape.htm">Tape Cartridge Usage</a></p>
<p><a href="usagdisk.htm"><img src="bcdrom.gif" border=2 height=30 width=30align=center></a>
    <a href="usagdisk.htm">Disk Usage</a></p>
<br><i>Contact: Vecdet Mehmet-Ali, mehmvec@statcan.ca<i></p>
</body>
</html>
```

Selecting the hyper-link *CPU Usage* on the Web page will display the chart produced by SAS.
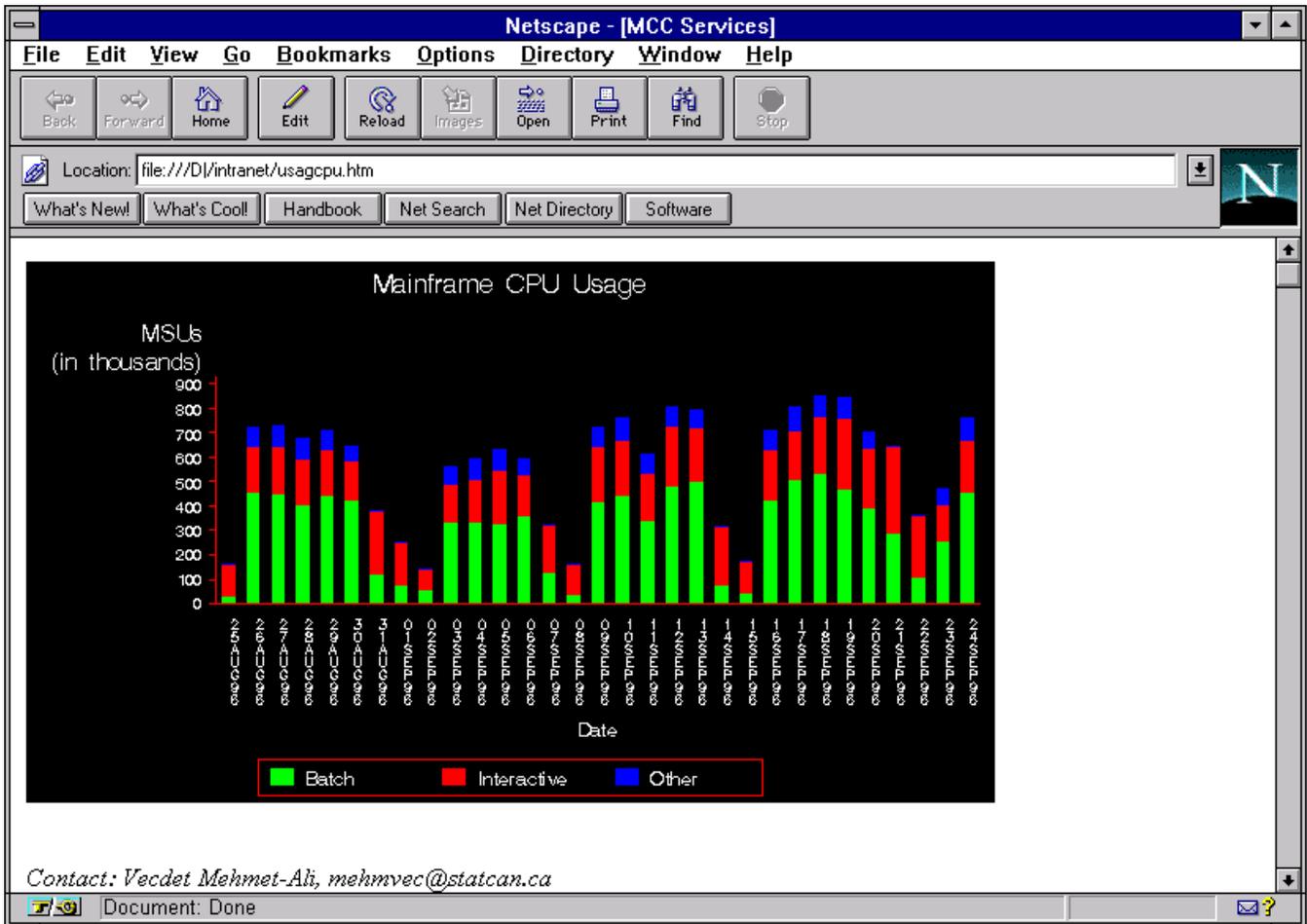
Mainframe CPU Usage page on Statistics Canada Intranet

The HTML source of the above page is:

```
<html>
<head>
<title>MCC Services</title>
</head>
<body>
<a><img align=center src='usagcpu.gif'></a>
<p><br><i>Contact: Vecdet Mehmet-Ali, mehmvec@statcan.ca<i>
</body>
</html>
```

Conclusion

The application of Internet technologies in an Intranet setting can dramatically increase the flow and value of information within an organization. Users can gain quick and timely access to a much wider variety of existing information residing in a variety of original forms and sources. In addition, traditional paper-based information distribution can be displaced by Intranet applications, lowering costs and increasing the timeliness of information flow. Intranet applications can start at small scale and grow upwards over time, gradually providing or facilitating access to an increasing breadth of information, thus improving both employee productivity and satisfaction.

We look forward to a version of SAS which can produce the graphics on the mainframe; and to a technology that will allow improved scaling of those graphics on the client's Web browser.

References

SAS Institute, Inc., *SAS Companion for the Microsoft Windows NT Environment, Version 6*, *First Edition,* Cary, NC: SAS Institute Inc., 1993

SAS Institute, Inc., *SAS/GRAPH Software: Reference, Version 6, First Edition, Volume 1,* Cary, NC: SAS Institute Inc., 1990. 794 pp.

SAS Institute, Inc., *SAS/GRAPH Software: Reference, Version 6, First Edition, Volume 2,* Cary, NC: SAS Institute Inc., 1990. 664 pp.

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