Programming in G language of LabView and development a Web page for the remote access using LabView tools

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Preface

During the stage in the INFN we built a program in LabVIEW that allows elaborating remote data, using a Web browser. The user, accessing an HTML page from the network, can ask to elaborate some data. With this program we could handle any data but we decided to elaborate the data of environment radiation collected by other students in our school and in the INFN laboratory.
In order to carry out this program we had to learn the LabVIEW G language, what is a Web server and how to configure it, how to write an HTML page, how to manage CGI queries.

What is LabVIEW?

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a development environment based on graphical programming: it relies on graphical symbols rather than on text-based language to describe programming actions. LabVIEW programs are called virtual instruments, or VI, because their appearance and operation imitate physical instruments. Every virtual instrument uses functions that manipulate input from the user interface or other sources and display that information or move it to other files or other PCs. A VI contains the following three components: Front Panel (serves as the user interfaces), Block Diagram (contains the graphical source code that defines the functionality), Icon and Connector pane (identifies the VI so that you can use the VI in other VI).
A VI within another VI is called subVI. A subVI corresponds to a subroutine in text–based programming languages.

HTML

HTML is a universal language for hypertext used in World Wide Web clients. HTML documents consist of plain text with embedded tags. You use tags for sectioning HTML documents, setting styles and colours, specifying links etc.
The HTML language continually changes. Because of this, some tags can be understand only by their own browser application but are not part of the official standard. This practice doesn't cause problems because the HTML specification states that browsers should ignore tags they don't understand.

WEB SERVER and CGI

Web servers are designed around a certain set of basic goals: accept network connections from browser; retrieve content from disk; run local CGI programs; transmit data back to clients; be as fast as possible. The first step is to view the WEB server as a black box and ask the questions. It serves static content to a WEB browser that receives a request for a WEB page and map that to a local file on the local host server. The server then loads this file from disk and serves it out across the network to user's WEB browser. This entire exchange is mediate by the WEB browser and server talking to each other using Hyper Text Transfer Protocol (HTTP).
The most important expansion on this was the concept of dynamic content (i.e., Web pages created in response to a user's input, whether directly or indirectly). The oldest and most used standard for doing this is Common Gateway Interface (CGI) that basically defines how a WEB server should run programs locally and transmit their output through the WEB browser that is requesting the dynamic content.

Internet Toolkit

Internet Toolkit is the extension in LabVIEW of the Internet protocol. It implements the WEB server (G WEB server) and CGI-BIN.

The G Web Server

The G Web Server is an HTTP\1.0-compatible server for making HTML and other documents available on the Internet and for connecting VI's to the net. The G Web Sever can perform the following tasks with your VI's: publishes VI instruments on the Web (you can publish static or animated images of the your VI on the net) and work with CGI VI instrument (you can develop CGI VI's that execute dynamically when a browser requests them).

Our Program

A remote user can select, on an HTML page, data to be elaborated and the kind of manipulation to perform on them (plot, mean, maximum, minimum) (see fig.1). In Appendix A you can find the HTML source of this page.

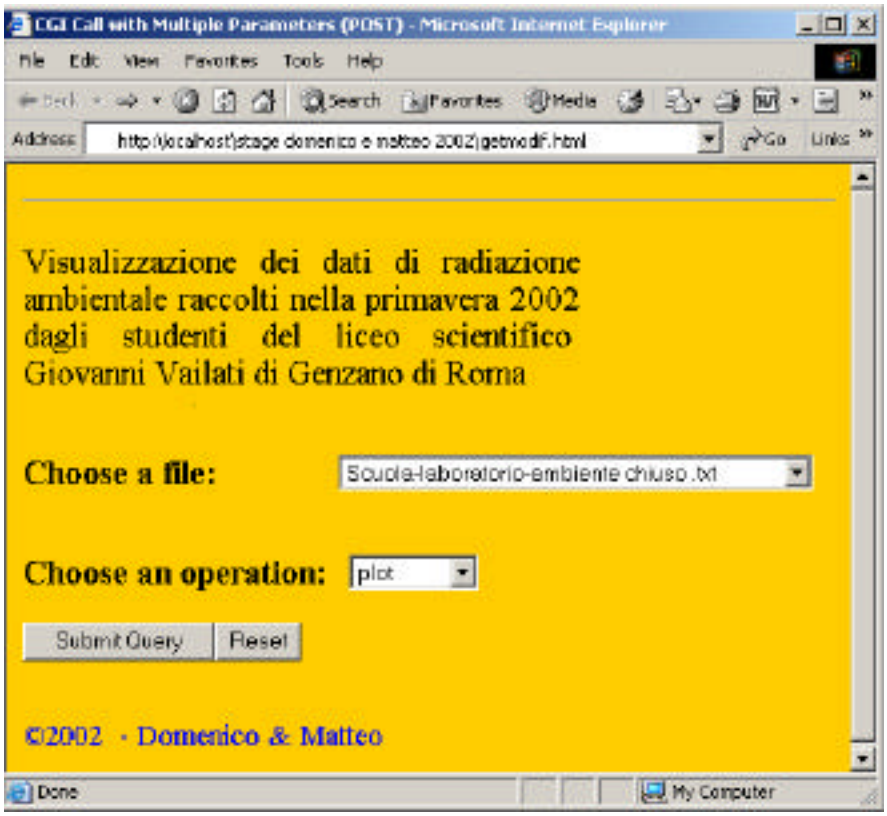

Fig.1 HTML page

This HTML page sends, through the network, a CGI request to a G WEB server that accepts it and passes it to a LabVIEW VI called *get.vi* (see fig.2).

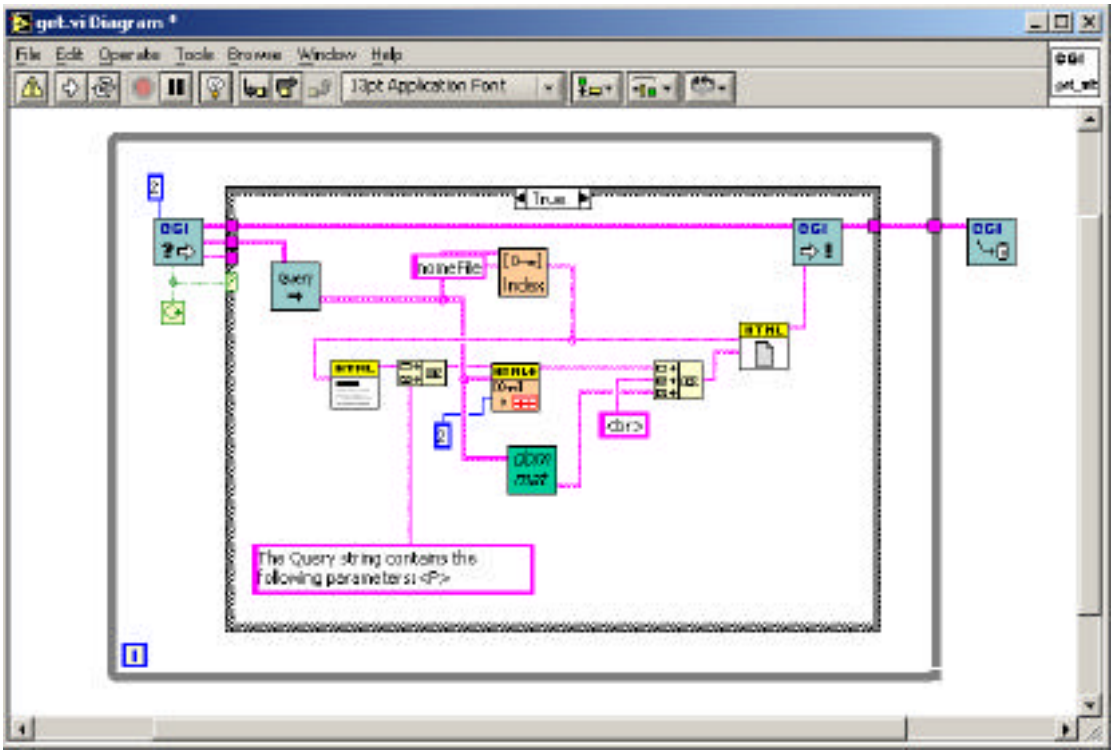

Fig.2 get.vi diagram

In the following, the functionality of each element of the *get.vi* diagram is described:

passes the CGI request made by the WEB browser to the LabVIEW program

extracts from the CGI query the parameters selected by the user

elaborates data and returns back a string in HTML format that will be inserted in the final HTML page

contribute building an HTML page that is sent back by 

to the remote user that asked for it.

releases the resources allocated by CGI.

domenicomatteo.vi program

is the core of our program, called *domenicomatteo.vi*. Its diagram is shown in fig.3

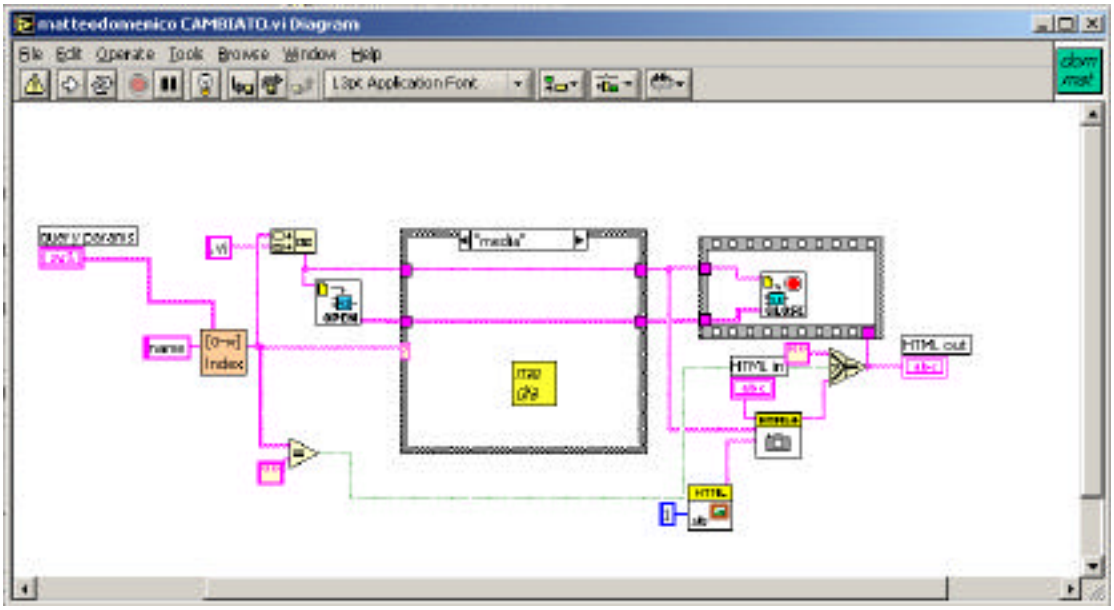

Fig.4 domenicomatteo.vi diagram

Index selects parameters from query params (that contains the options selected by the user) depending on an input constant. In this way, the operation chosen by the user is selected.

OPEN opens a certain VI (for example the VI that performs the mean operation on the selected data)

media performs the mean on the selected data

HTML+ and HTML collect an image of the front panel of the program opened by OPEN and put it in HTML format, rEady to be sent back to *get.vi*

CLOSE closes the VI opened by OPEN

Appendix A

```
<!--last modified on Fri, Apr 17, 1998 8:39 AM-->
<html xmlns:v="urn:schemas-microsoft-com:vml"
xmlns:o="urn:schemas-microsoft-com:office:office"
xmlns:w="urn:schemas-microsoft-com:office:word"
xmlns="http://www.w3.org/TR/REC-html40">

<head>
<meta http-equiv=Content-Type content="text/html; charset=iso-8859-1">
<meta name=ProgId content=Word.Document>
<meta name=Generator content="Microsoft Word 9">
<meta name=Originator content="Microsoft Word 9">
<link rel=File-List href="./getmodif_files/filelist.xml">
<link rel=Edit-Time-Data href="./getmodif_files/editdata.mso">
<!--[if !mso]>
<style>
v\:* {behavior:url(#default#VML);}
o\:* {behavior:url(#default#VML);}
w\:* {behavior:url(#default#VML);}
.shape {behavior:url(#default#VML);}
</style>
<![endif]-->
<title>CGI Call with Multiple Parameters (POST)</title>
<!--[if gte mso 9]><xml>
 <o:DocumentProperties>
  <o:Author>user</o:Author>
  <o:LastAuthor>user</o:LastAuthor>
  <o:Revision>10</o:Revision>
  <o:TotalTime>10</o:TotalTime>
  <o:Created>2002-05-24T12:06:00Z</o:Created>
  <o:LastSaved>2002-05-24T12:32:00Z</o:LastSaved>
  <o:Pages>1</o:Pages>
  <o:Words>58</o:Words>
  <o:Characters>334</o:Characters>
  <o:Company>LNF - INFN</o:Company>
  <o:Lines>2</o:Lines>
  <o:Paragraphs>1</o:Paragraphs>
  <o:CharactersWithSpaces>410</o:CharactersWithSpaces>
  <o:Version>9.2720</o:Version>
 </o:DocumentProperties>
</xml><![endif]-->
<link rel=Stylesheet type="text/css" media=all href="..\itk.css">
<style>
<!--
 /* Font Definitions */
@font-face
      {font-family:Ravie;
      panose-1:4 4 8 5 5 8 9 2 6 2;
      mso-font-charset:0;
      mso-generic-font-family:decorative;
      mso-font-pitch:variable;
      mso-font-signature:3 0 0 0 1 0;}
 /* Style Definitions */
p.MsoNormal, li.MsoNormal, div.MsoNormal
      {mso-style-parent:"";
      margin:0in;
      margin-bottom:.0001pt;
      mso-pagination:widow-orphan;
```

```
p.MsoBodyText, li.MsoBodyText, div.MsoBodyText
      {margin-top:0in;
      margin-right:608.25pt;
      margin-bottom:0in;
      margin-left:0in;
      margin-bottom:.0001pt;
      text-align:justify;
      mso-pagination:widow-orphan;
      font-size:12.0pt;
      font-family:Ravie;
      mso-fareast-font-family:"Times New Roman";
      mso-bidi-font-family:"Times New Roman";}
p.MsoBodyText2, li.MsoBodyText2, div.MsoBodyText2
      {margin:0in;
      margin-bottom:.0001pt;
      text-align:justify;
      mso-pagination:widow-orphan;
      font-size:12.0pt;
      font-family:Ravie;
      mso-fareast-font-family:"Times New Roman";
      mso-bidi-font-family:"Times New Roman";}
a:link, span.MsoHyperlink
      {color:blue;
      text-decoration:underline;
      text-underline:single;}
a:visited, span.MsoHyperlinkFollowed
      {color:blue;
      text-decoration:underline;
      text-underline:single;}
tt
      {mso-ascii-font-family:"Courier New";
      mso-fareast-font-family:"Courier New";
      mso-hansi-font-family:"Courier New";
      mso-bidi-font-family:"Courier New";}
@page Section1
      {size:8.5in 11.0in;
      margin:1.0in 1.25in 1.0in 1.25in;
      mso-header-margin:.5in;
      mso-footer-margin:.5in;
      mso-paper-source:0;}
div.Section1
      {page:Section1;}
-->
</style>
<!--[if gte mso 9]><xml>
 <o:shapedefaults v:ext="edit" spidmax="1027">
  <o:colormenu v:ext="edit" fillcolor="#fc0"/>
 </o:shapedefaults></xml><![endif]--><!--[if gte mso 9]><xml>
 <o:shapelayout v:ext="edit">
  <o:idmap v:ext="edit" data="1"/>
 </o:shapelayout></xml><![endif]-->
<meta name=Author content="Internet Toolkit">
</head>

<body bgcolor="#ffcc00" lang=EN-US link=blue vlink=blue style='tab-interval:
.5in'>

<div class=Section1>

<div class=MsoNormal align=center style='text-align:center'>
```

```
</div>

<p class=MsoNormal style='margin-right:119.25pt;text-align:justify;tab-stops:
9.0pt 3.5in center 6.25in'><br>
<span                    style='font-size:16.0pt;mso-bidi-font-size:12.0pt;font-
family:Ravie'>Visualizzazione
dei dati di radiazione ambientale raccolti nella primavera 2002 dagli studenti
del liceo scientifico<span style="mso-spacerun: yes">  </span>Giovanni
Vailati di Genzano di Roma<o:p></o:p></span></p>

<p class=MsoBodyText2><br style='mso-special-character:line-break'>
<![if !supportLineBreakNewLine]><br style='mso-special-character:line-break'>
<![endif]></p>

<p        class=MsoNormal><b><span        style='font-size:16.0pt;mso-bidi-font-
size:12.0pt'>Choose
a file:</span></b><span style='mso-spacerun:16&#13;&#10;yes'><span
style="mso-spacerun: yes">     </span><span
style="mso-spacerun: yes"> </span></span><span style="mso-spacerun:
yes">            &nb
sp;</span><SELECT NAME="nomeFile">
<OPTION SELECTED> Scuola-laboratorio-ambiente chiuso .txt
<OPTION>scuola-aula magna-ambiente con persone .txt
<OPTION>scuola-aula disegno-ambiente chiuso .txt
<OPTION>scuola-presidenza-ambiente chiuso .txt
<OPTION>INFN-laboratorio-ambiente con persone .txt
<OPTION>INFN-laboratorio_2-ambiente con persone .txt
<OPTION>INFN-ambiente-su un terrapieno .txt
<OPTION>INFN-acceleratore Dafne-punto 1 .txt
<OPTION>INFN-acceleratore Dafne-punto 2 .txt
<OPTION>INFN-acceleratore Dafne-punto 3 .txt
</SELECT></p>

<p class=MsoNormal><![if !supportEmptyParas]> <![endif]><o:p></o:p></p>

<p class=MsoNormal><![if !supportEmptyParas]> <![endif]><o:p></o:p></p>

<p        class=MsoNormal><b><span        style='font-size:16.0pt;mso-bidi-font-
size:12.0pt'>Choose
an operation: <span style="mso-spacerun: yes"> </span></span><span
style='mso-spacerun:16              yes'><span              style="mso-spacerun:
yes"> </span></span><SELECT NAME="name">
<OPTION SELECTED> plot
<OPTION>minimo
<OPTION>massimo
<OPTION>media
</SELECT><br>
</b><span                                                          style='mso-tab-
count:1'>           
</span><o:p></o:p></p>

<p class=MsoNormal><INPUT TYPE="SUBMIT" NAME="Submit"
ACTION="http:\\193.206.80.222:8080\cgi-bin\stage\get.vi" METHOD=GET
ACTION="http:\\193.206.80.222:8080\cgi-bin\stage\get.vi" METHOD=GET
ACTION="http:\\193.206.80.222:8080\cgi-bin\stage\get.vi"       METHOD=GET><INPUT
TYPE="RESET" NAME="Reset"><br>
<br>
<br>
<span style='font-size:14.0pt;mso-bidi-font-size:12.0pt;color:blue'>©2002<span
style="mso-spacerun: yes">  </span>- Domenico &amp; Matteo </span></p>
</div>
```