



The DELPHI RICH Web Presenter

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Abstract

The DELPHI RICH Web Presenter is a tool that allows access to DELPHI Presenter histograms from the World Wide Web while retaining the full functionality of the DELPHI Presenter. This is accomplished by an interplay of Java applets and CGI scripts. The DELPHI RICH Web Presenter gives access to monitoring histograms of the Barrel and Forward RICH detectors, multi-hadronic event histograms, and minimum bias histograms.

1. Introduction

The Web Presenter is a program developed at DELPHI RICH for the purpose of giving access to DELPHI Presenter (see [1]) histograms from the World Wide Web. Such a possibility was deemed potentially useful for users who are not physically present at CERN but wish to access the Presenter histograms from their home institute or from their home. The problem with accessing DELPHI Presenter histograms directly from a remote location is that the plotting of the histograms is done remotely and then high-resolution complex graphics are transferred over a generally slow link. In the Web Presenter, however, histogram data is transferred and the plotting is done locally in the user's Web browser by a Java applet. In its prototype stage the DELPHI RICH Web Presenter gives access to a number of recent histograms produced by the Barrel and Forward RICH detectors but it can readily and easily be extended to cover other detectors, even all of DELPHI Presenter's histograms.

The Web Presenter was designed using the benefits offered by the increasingly popular Java language. The main benefit of Java is the possibility of creating small portable applications or applets that run in Web browsers and can be embedded into and controlled from Web pages. As for portability, Java allows the design of platform independent programs, at least in theory. The Web Presenter was tested, though not extensively, on a number of platforms including Windows 95, X Windows, Mac OS, and VMS with Netscape or Internet Explorer browsers, or both. A list of known compatibility bugs is available at <http://delphi-rich.cern.ch/webpresenter/bugs.html>.

Another important component of the Web Presenter are CGI scripts. These are programs that are executed on the host computer by an appropriate call from the client Web browser. For the Web Presenter these programs provide a bridge between histograms stored in the ZEBRA RZ format and Java applets which are unable to read this format directly.

2. Building Blocks

2.1 Java and Java Applets

Programs written in the Java language are not compiled in the usual way into machine code that can only be understood by a specific type of computer processor running a specific operating system. Instead they are compiled into byte-code, instructions for a virtual machine - a Java Virtual Machine, that can be emulated on any contemporary platform. Because of this a program written in Java can be executed on different platforms without requiring any modification. More information on Java is available throughout the Web, a good place to start is the page of the people who created the language [2].

Java is by design an object oriented language. The object structure of the language is quite rigid but many allowances have been made to provide flexibility in programming. The purpose of such a structure was to allow for flexibility but minimize on the possibility of the programmer to make oversights which would lead to run-time errors. The language is supplemented by an extensive object library, counterpart to function and procedure libraries in older languages, which provides a set of building blocks that greatly simplify the development of sophisticated applications.

Also, the Web is Java's native domain. Java was designed to exploit all possible resources of the Web easily. This is done both through the possibility of building applications that run remotely – over the Web - either on clients, such as applets, or on servers, such as servlets, and by incorporating into the object library tools for accessing information on the Web from regular applications. More sophisticated techniques also exist which allow the communication of entire objects over the network instead of just data.

Finally there is very strong support on the Web for programming in Java. This support comes in the form of online tutorials (see [3] for example) or library (API) indexes (see [4]). Moreover the tools necessary for writing and running Java programs are available for free at [2].

Java applets are also applications written in the Java language. They are transferred over the Web the same way a Web page is, and are executed on a virtual machine that is built into Web browsers. Because of speed and safety considerations Java applets are somewhat limited in comparison to a normal Java program. These limitations particularly pertain to operations involving reading and writing files to a disk. There are other limitations also, for more information see [5].

Applets reside on Web pages much the same way that text and images do. In HTML it is possible to specify the position of the applet on the page as well as the size it takes up on it. More importantly, from HTML it is possible to specify different parameters for applets which makes the applet controllable from within the HTML page in which it is embedded.

2.2 Common Gateway Interface Scripts

CGI scripts are programs written in any language, but mostly in a scripting language like Perl hence the name scripts. They are invoked by clients who send their requests over the Web. They are executed, however, on the server. The client can invoke a CGI script by specifying its location on the server and its name. There exists a defined protocol for passing parameters to the CGI script in several different ways. Generally parameters are passed either as command line parameters or as standard input.

To the user all of this is in most cases completely transparent since all the information necessary to invoke the CGI script is contained within the HTML coding of a Web page and all the user has to do is click on a link.

After the CGI script has done the processing required it can communicate the results to the client in one of two general ways. It can instruct the client's browser to display a certain Web page, or it can generate and transmit a Web page in its entirety to the browser. The browser displays this page as if it were any other page on the Web, even though the page was generated by the CGI and does not exist anywhere on the Web. So accessing information through a CGI script appears exactly as loading any page on the Web.

CGI is by far the most used Web tool. For more information on CGIs see an HTML reference, for example [6].

3. The Web Presenter

The Web Presenter relies heavily on applets and CGI scripts to fulfill its task of presenting histograms on the Web. The pages containing histograms look somewhat like pages in the DELPHI presenter, and have the same names, but each page is generated by the CGI script each time a request is made for it to be displayed. Every histogram on the page is in fact an applet that transfers the data from the server and draws the histogram. The whole page does not really exist anywhere – it is generated dynamically upon request.

There are two main CGI scripts at work in the Web Presenter. One provides the directory listing which allows the user to select a fill or a run to be displayed and the other one handles the conversion of the data and generates the pages with the histograms. For a better understanding of how the various components of the Web Presenter interact it is helpful to consider a typical session in the use of this program.

3.1 A Sample Session

The Web Presenter can be found at the Internet address: <http://delphi-rich.cern.ch/webpresenter>. Figure 1 shows the first page of the Web Presenter as displayed by a Netscape browser when the address has been accessed. The first page has the same function as the selection of the configuration file in the DELPHI Presenter. The prototype DELPHI RICH Web Presenter gives Web access to monitoring histograms of the Forward and Barrel RICH detectors as well as to some multi-hadron event (Z0) and minimum bias histograms also for the Forward and Barrel RICH detectors.

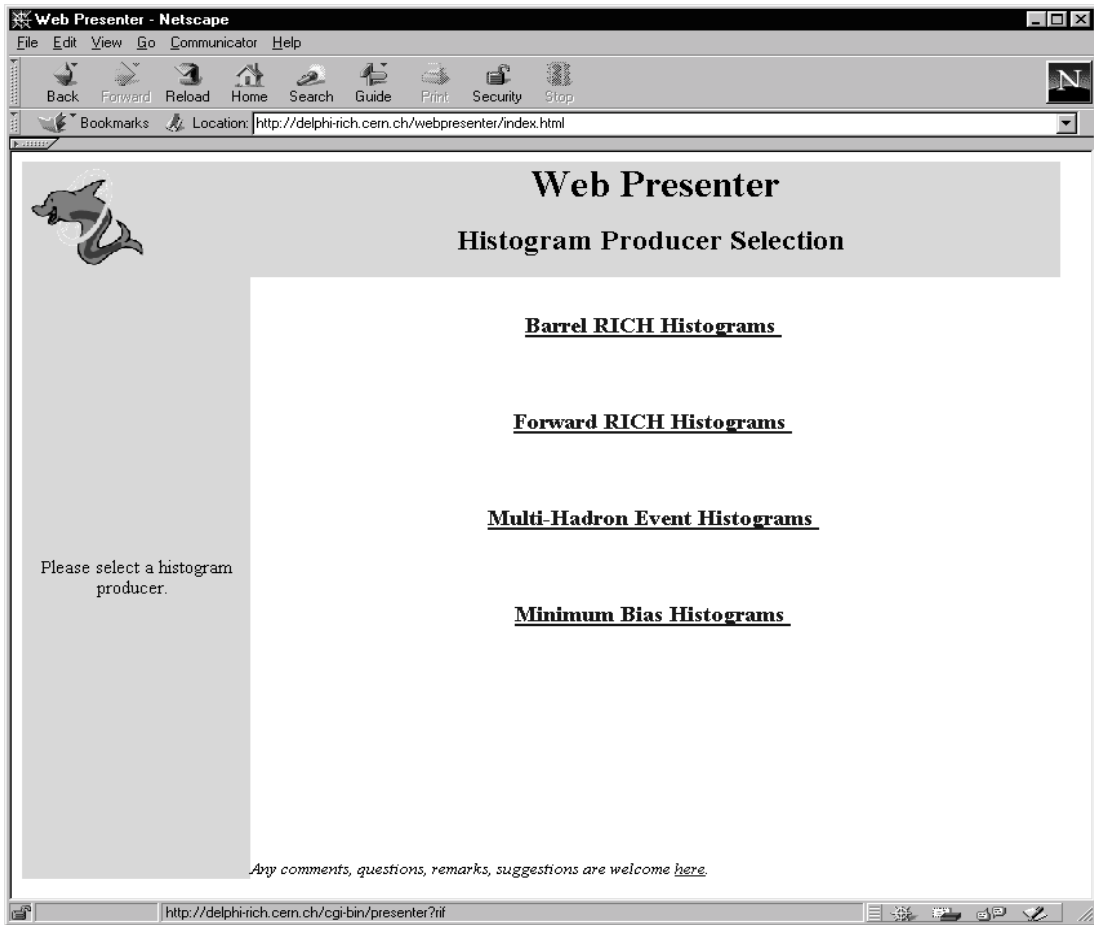


Figure 1: The first page of the Web Presenter

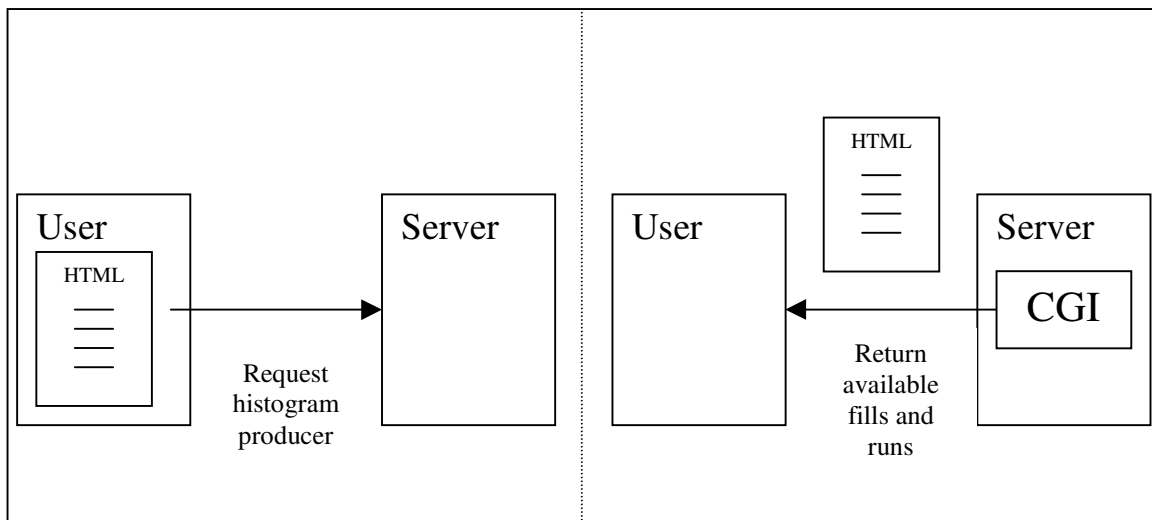


Figure 2: Flow of information between the user and server in the execution of the first CGI

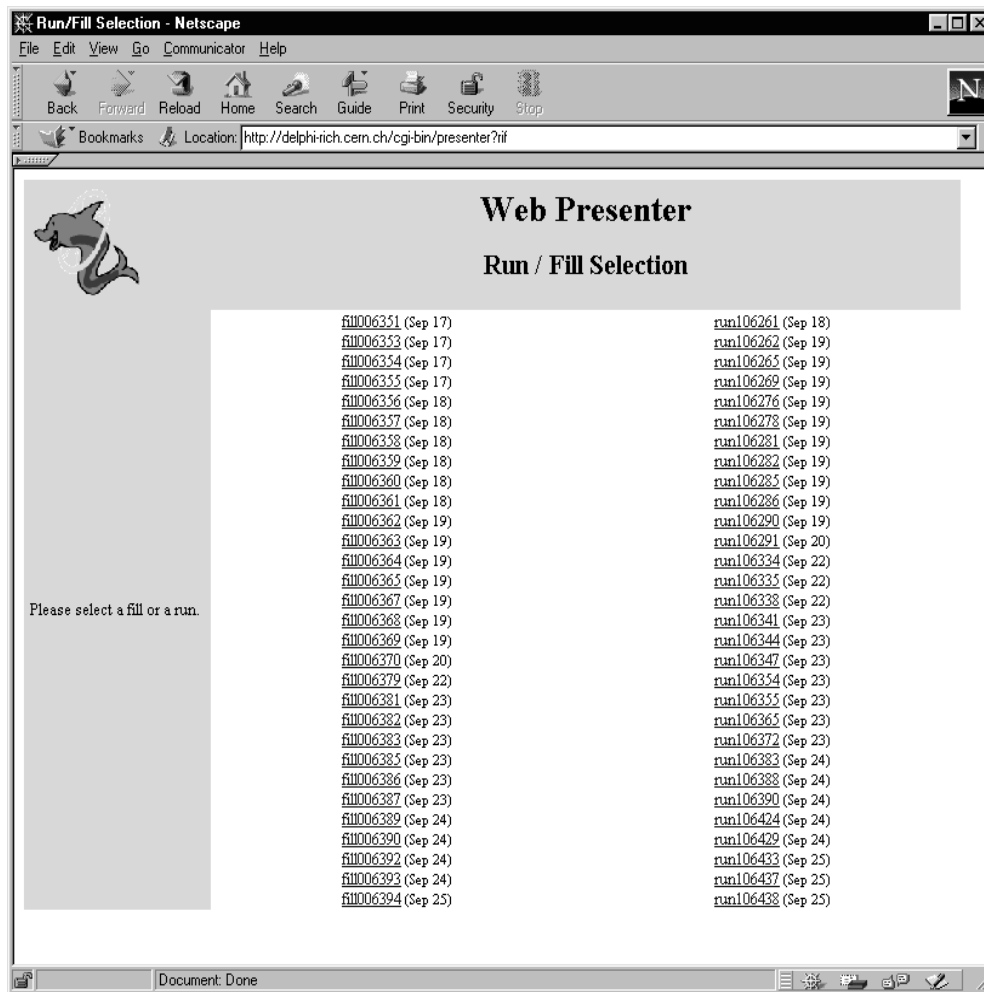


Figure 3: The second page of the Web Presenter

To access these four configurations, four links are provided on the page. These links do not lead to other Web pages but invoke the CGI script that will provide the listing of fills and runs available for viewing as shown in Figure 2. The output of this script is shown in Figure 3. Besides invoking the CGI script the above mentioned links also pass a parameter to it which determines for which configuration the listing is made.

The syntax of invoking the script and passing a parameter to it through the mere specification of an Internet address can be observed in the status bar at the bottom of the browser window in Figure 1. This status bar contains the address of the link currently pointed to by the mouse pointer, in this case the second link: *Forward RICH Histograms*. From the address we can see that the name of the CGI script located on server *delphi-rich.cern.ch* in the directory *cgi-bin* is *presenter* and that the parameter passed to it is *rif*.

The second page, shown in Figure 3, shows a listing of available fills and runs for the Forward RICH detector. This page was generated by a CGI script which read the directory where the run and fill files are located and prepared a page with the list. Each fill or run on the page is a link. A click on any of these links will invoke a second CGI

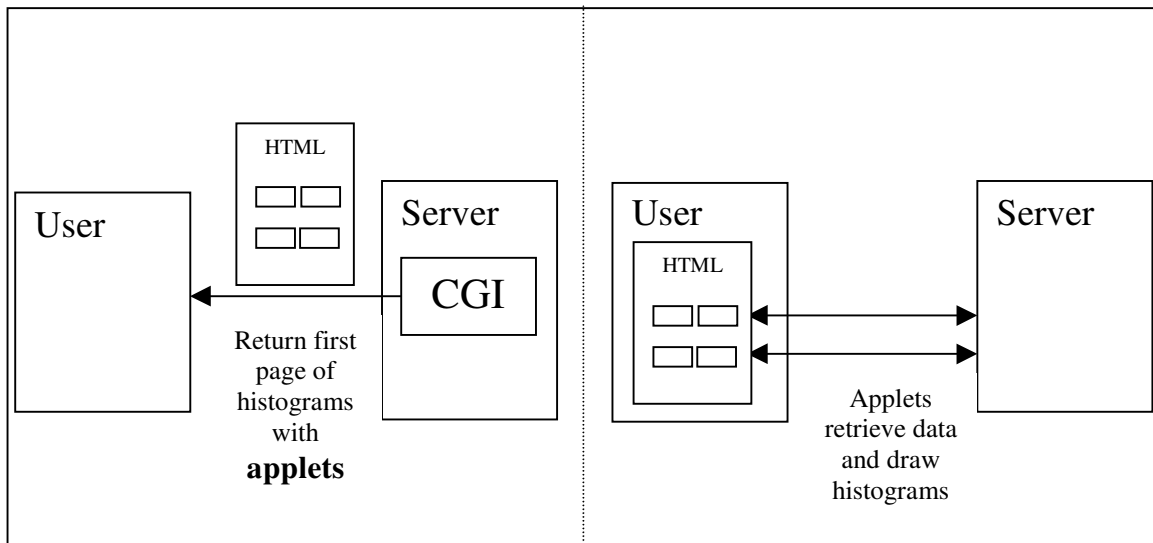


Figure 4: Flow of information between the user and server in the execution of the second CGI

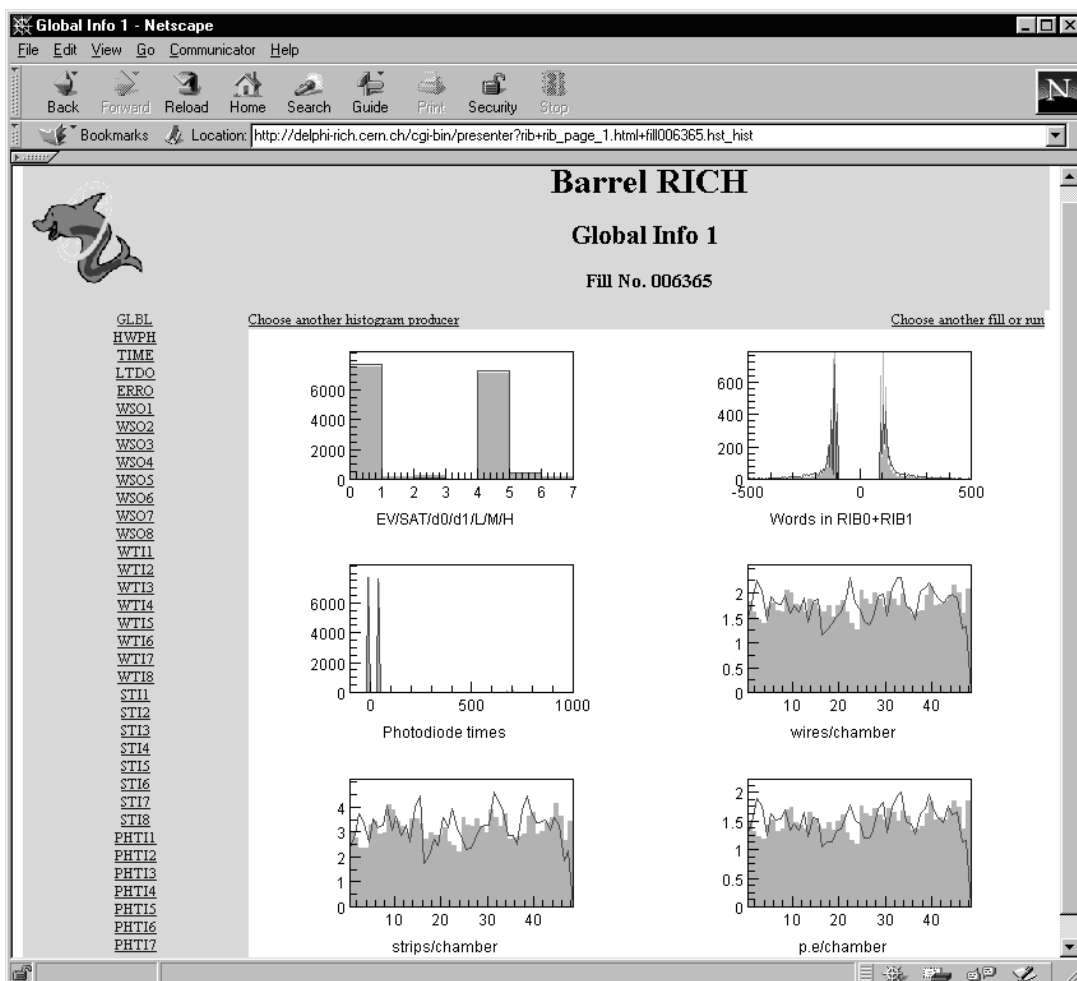


Figure 5: A typical page with histograms of the Web Presenter

script that will generate the first page of the configuration that was selected. This process is illustrated in Figure 4. The page generated by the CGI and transferred to the user contains Java applets which will draw the histograms. An example for the Barrel RICH is shown in Figure 5.

The first page of the configuration and all following pages contain the same histograms as their counterparts in the DELPHI Presenter. Each histogram on the Web Presenter page is an applet executing independently of other histograms. Each applet contacts the server and retrieves the data for its histogram and subsequently draws the histogram according to the parameters specified in the page as shown in Figure 4. The parameters allow for a number of settings to be made such as data histogram style, reference histogram style, color of the data, color of the reference, background color, label of the histogram and reference normalization. This allows for easy redesigning or adding of Web pages with other histograms.

To create the DELPHI RICH histogram pages a semi-automatic procedure was developed. The parameters such as the number of histograms, their layout on the page, and the histogram numbers had to be entered manually but the page generation is automatic. It is conceivable that in some future development of the Web Presenter a program could be made that would fully automate the creation of histogram Web pages by translating the DELPHI Presenter configuration files. This however is a highly complex task since the scripting language used to create the DELPHI Presenter pages has a very complicated structure. Because of this such a program might require the use of some advanced techniques including pattern recognition.

A typical histogram page of the Web Presenter, shown in Figure 5, has several features that should be mentioned. The left side of every page contains a list of links to all the pages in the selected configuration. Clicking on any of the names will cause that page to be displayed. At the top of the page two links are available. The left one returns the user to the first page, to select another configuration. The right one allows the selection of a different fill or run for the same configuration. Finally each of the histograms on the page can be enlarged by pointing to it and clicking the left mouse button. Newer browsers allow the user to resize the windows containing the display of the zoomed histogram, thereby adjusting the enlargement to their needs. The display of the enlarged histogram offers the user the option to select a part of the histogram to be enlarged by clicking with the left mouse button on the endpoints of the interval of channels that needs to be enlarged. Clicking the right mouse button on the histogram on the page will display the help available for the histogram.

The colors of the histograms were chosen to mimic those of the DELPHI Presenter. The reference is plotted as a filled light blue histogram and the data is plotted as a red line connecting the data points.

The Web Presenter runs presently on the pcrich09 local server. It relies on several processes running on the server, as well as on the DELPHI online VAX system to receive fresh histograms. The histogram list is updated every half-hour with any new fill or run

files that may have been created. Currently the Web Presenter offers 30 of the most recent fills and runs to be displayed.

Any future development of the Web Presenter will include the possibility to view the histograms online, as they are created. Also, the conversion of DELPHI Presenter pages should be automated which will also facilitate the addition of new pages, not previously contained in the DELPHI Presenter. The communication of the applets with the server may be improved upon, especially in a situation where there are many simultaneous users. This can be done by developing an object server that would allow data to be present within the applets at the time they are passed to the user with the HTML page. This would improve upon the speed of communication by reducing the number of requests made to the server and the number of connections that need to be established.

4. Conclusion

The Web Presenter is a tool that can be used to access DELPHI Presenter histograms over the Web. It accomplishes this by the use of Java applets that can download histogram data and plot it locally in the user's Web browser. CGI scripts provide conversion from ZEBRA files and directory listings on the server and dynamically generate Web pages upon request.

The Web Presenter supports all features available in the DELPHI Presenter such as the zooming of entire histograms and the zooming of parts of histograms. The possibility of having an online help is also supported.

The Web Presenter can be readily extended to cover other DELPHI detectors and possibly all DELPHI histograms that are available from the DELPHI Presenter.

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References

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