

ROOT I/O IN JAVASCRIPT

Reading ROOT files in a browser

B. Bellenot, CERN, PH-SFT

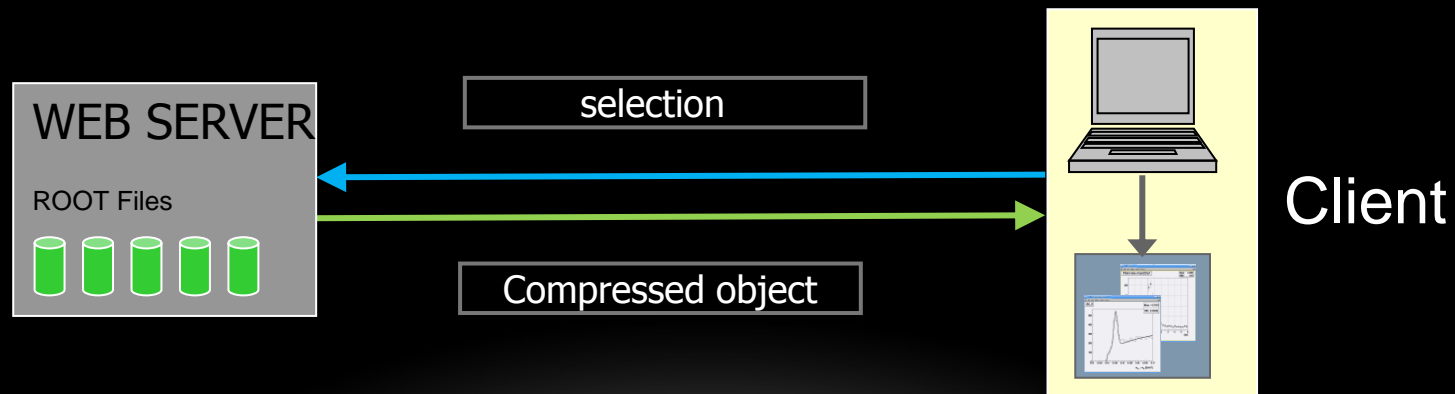
B. Linev, GSI, CS-EE

JAVASCRIPT

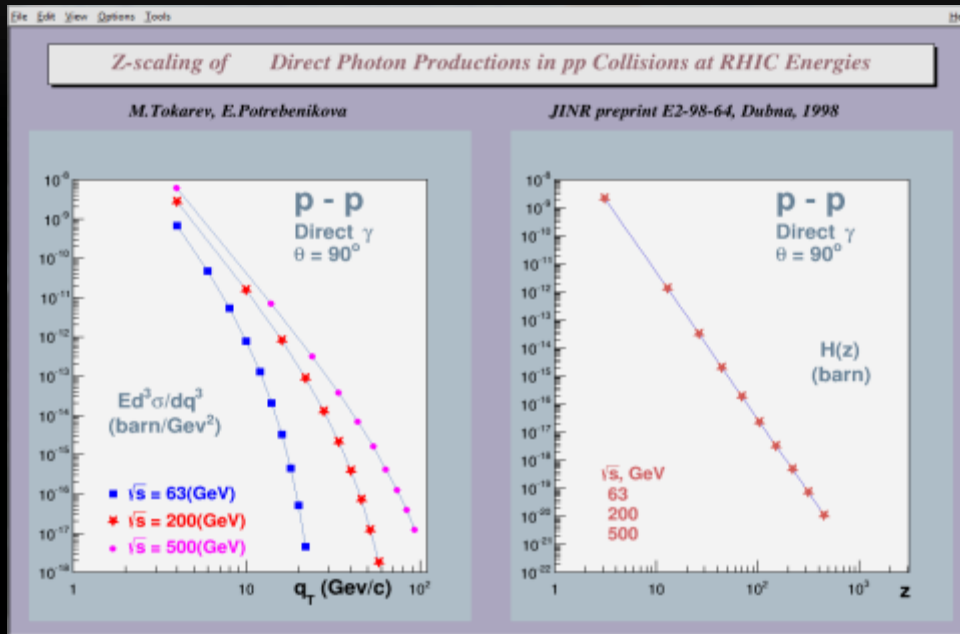
- One very nice feature of JavaScript is the possibility to dynamically (at runtime) create classes
- Allowed to implement dynamic streamers (automatically generated from the streamer info)
- Allows to potentially read any object from a ROOT file, as soon as we can read the streamer info of its class

READING THE FILE

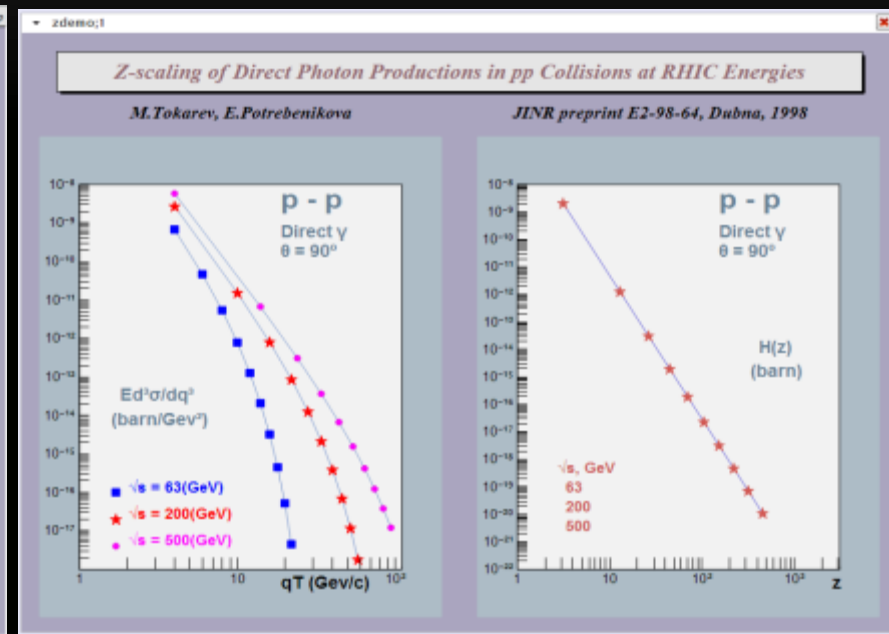
- Using HTTP byte range (available in HTTP/1.1) to download only a single compressed object when the user wants to read it
- Minimizes data transfer and memory usage
- Compressed (zipped) objects are in binary format



DISPLAYING OBJECTS

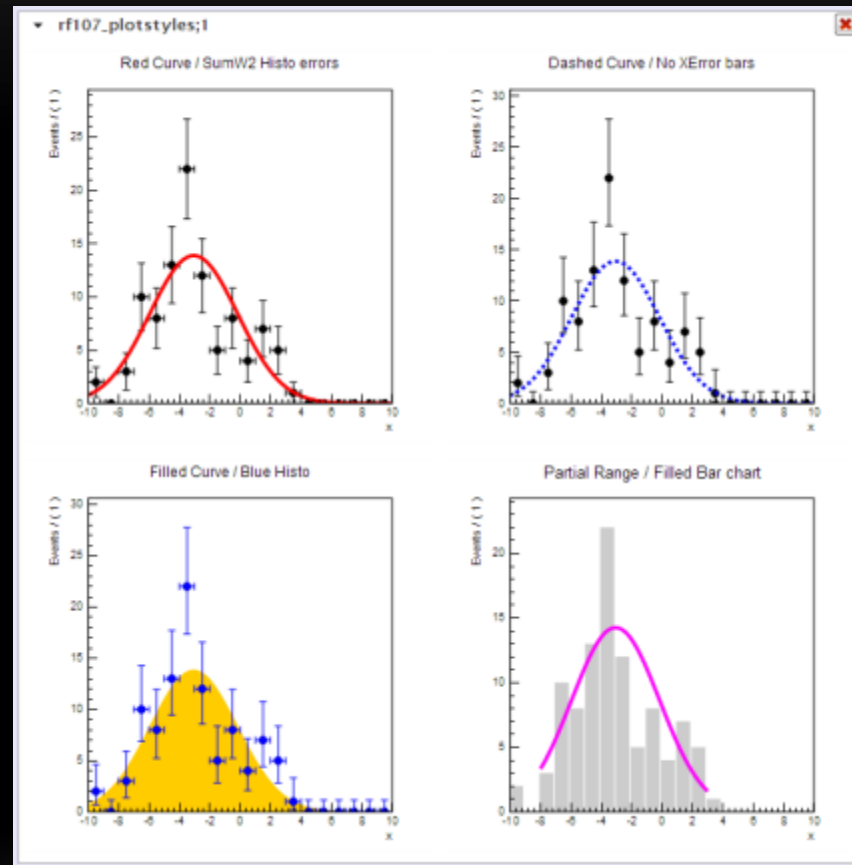


Original rendering (with ROOT)



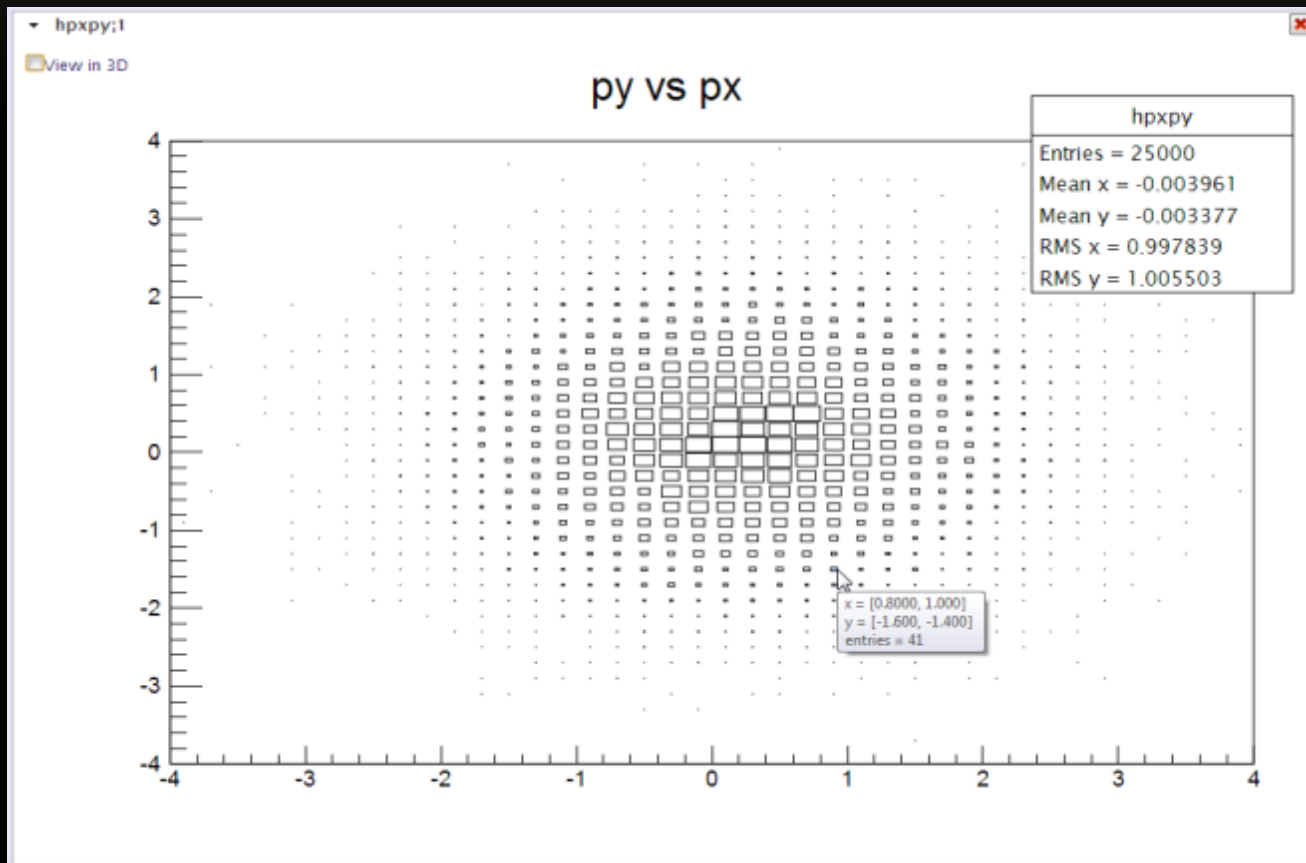
JavaScript rendering in a web browser:
Same font, same color, same layout! Only minor differences...

DISPLAYING OBJECTS (CONT.)



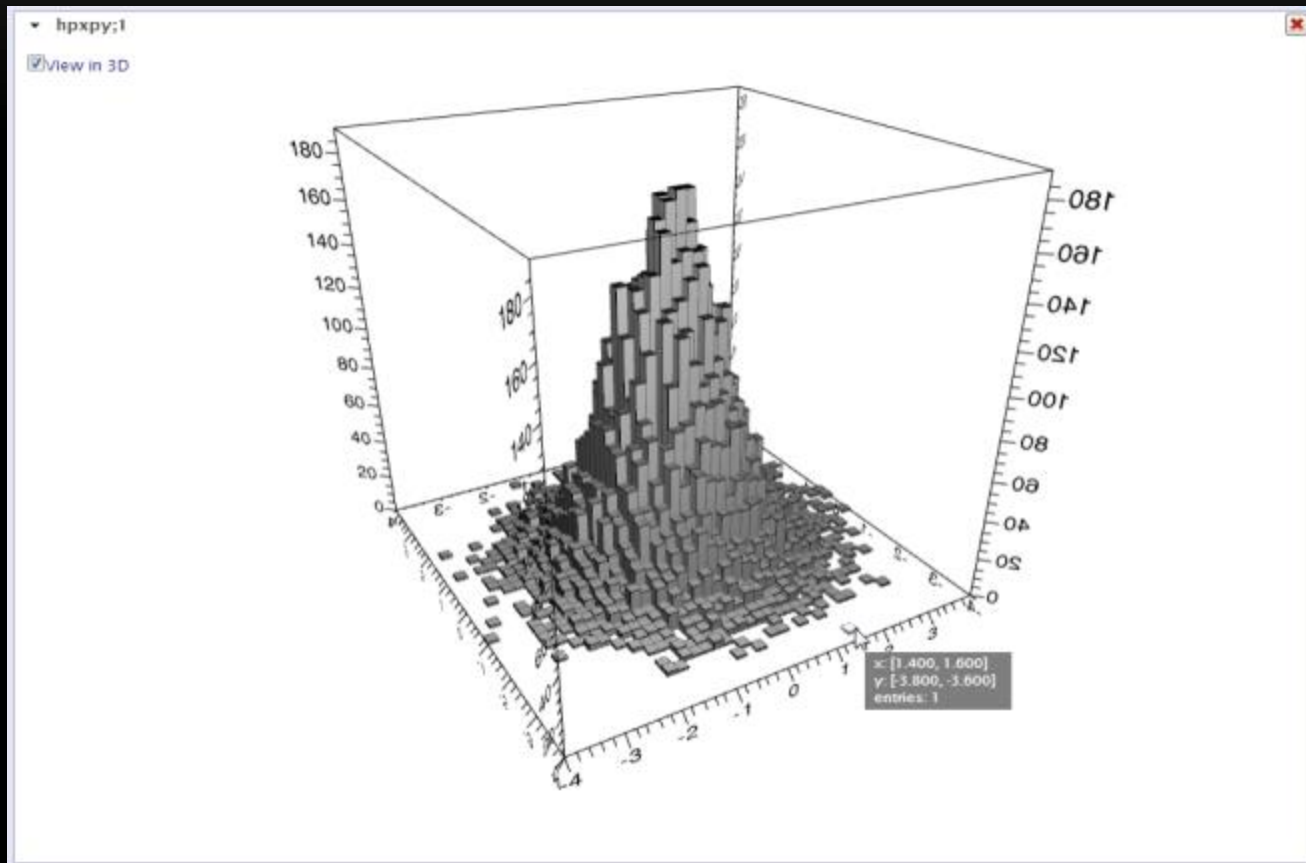
Example of roofit plot styles

DISPLAYING OBJECTS (CONT.)



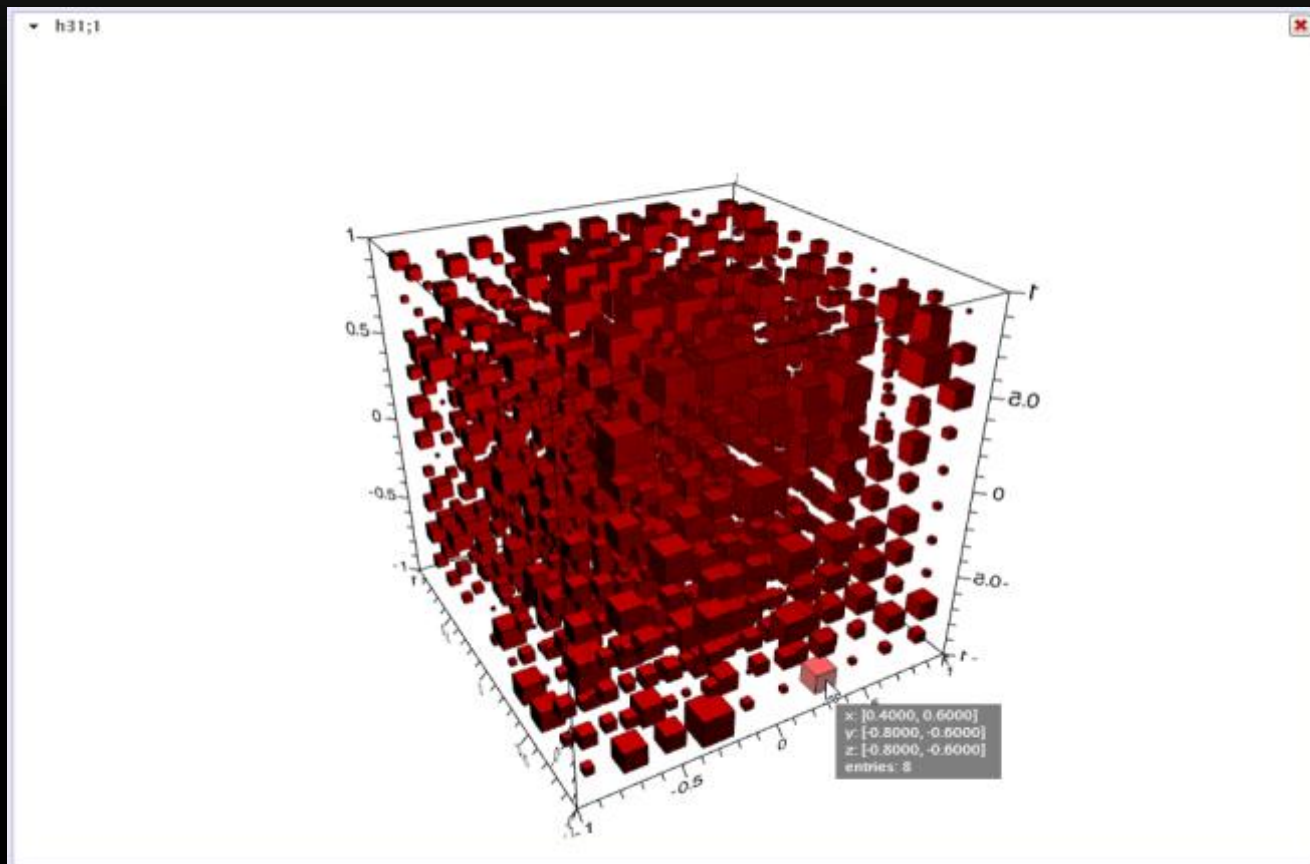
2D histogram (TH2), drawn with the BOX option (default)

DISPLAYING OBJECTS (CONT.)



Same histogram, displayed with 3D option (“LEGO”), using WebGL (when available)

DISPLAYING OBJECTS (CONT.)



3D Histogram (TH3), using WebGL (when available)

HOW TO USE IT?

- Simply copy the ROOT file(s) anywhere on the web
- Create a simple html page next to the files
 - Only two lines have to be added in the <head>
 - And a few lines in the <body>. Here is a complete example:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Read a ROOT file in Javascript (Demonstration)</title>
    <meta http-equiv="Content-type" content="text/html; charset=utf-8" />
    <link rel="stylesheet" type="text/css" href="http://root.cern.ch/js/style/JSRootInterface.css"/>
    <script type="text/javascript" src="http://root.cern.ch/js/scripts/JSRootInterface.js"></script>
  </head>
  <body onload="BuildSimpleGUI()">
    <div id="simpleGUI" files="file_1.root;file_2.root;file_n.root;"></div>
  </body>
</html>
```

MONITORING OF A RUNNING ROOT APPLICATION

ROOT session

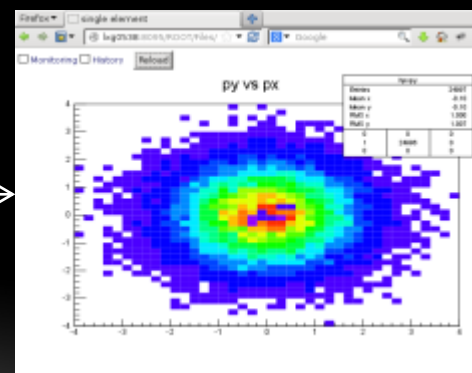
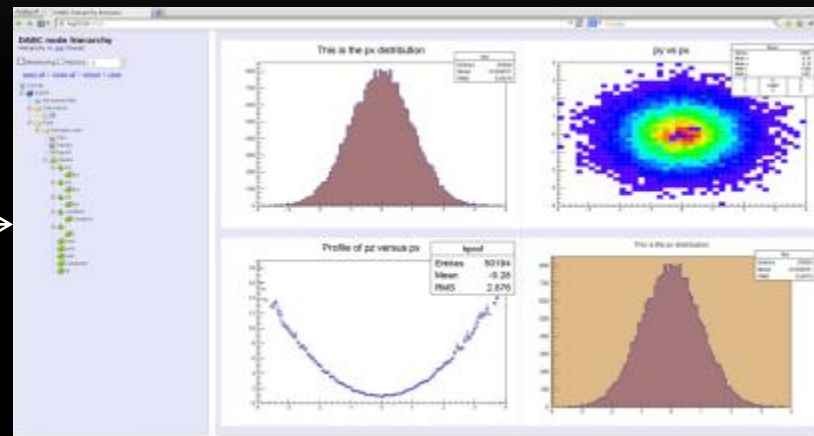
```
* You are welcome to visit our Web site *  
* http://root.cern.ch *  
* *  
*****
```

```
ROOT 5.34/09 (v5-34-09@v5-34-09, Jun 26 2013,  
17:10:36 on linuxx8664gcc)
```

```
CINT/ROOT C/C++ Interpreter version 5.18.00, July  
Type ? for help. Commands must be C++ statements.  
Enclose multiple statements between { }.
```

```
root [0] DabcRoot::StartHttpServer (8095) ;  
root [1] .x $ROOTSYS/tutorials/hsimple.C  
hsimple : Real Time = 0.14 seconds Cpu Time =  
0.14 seconds  
(class TFile*)0x7fbc1c26ed70  
root [2]
```

http



MONITORING OF A RUNNING ROOT APPLICATION

- Single command to start http server: `DabcRoot::StartHttpServer(8095);`
- Scans gROOT for existing objects
- Builds objects hierarchy in the browser
- Stream and zip objects **only when** requested
- JSRootIO graphics for objects display
- **Live** update of objects content
- **NO ANY** changes in analysis code
- Similar approach for: DAQ, slow control, online/offline analysis
- More information on <http://dabc.gsi.de>

CONCLUSION

- The source code is available in git:
<http://root.cern.ch/git/rootjs.git>
- Not a replacement of ROOT:
 - No tree analysis
 - No fitting

Feel free to try and to send feedback & requests