ROOT7 Fit Panel

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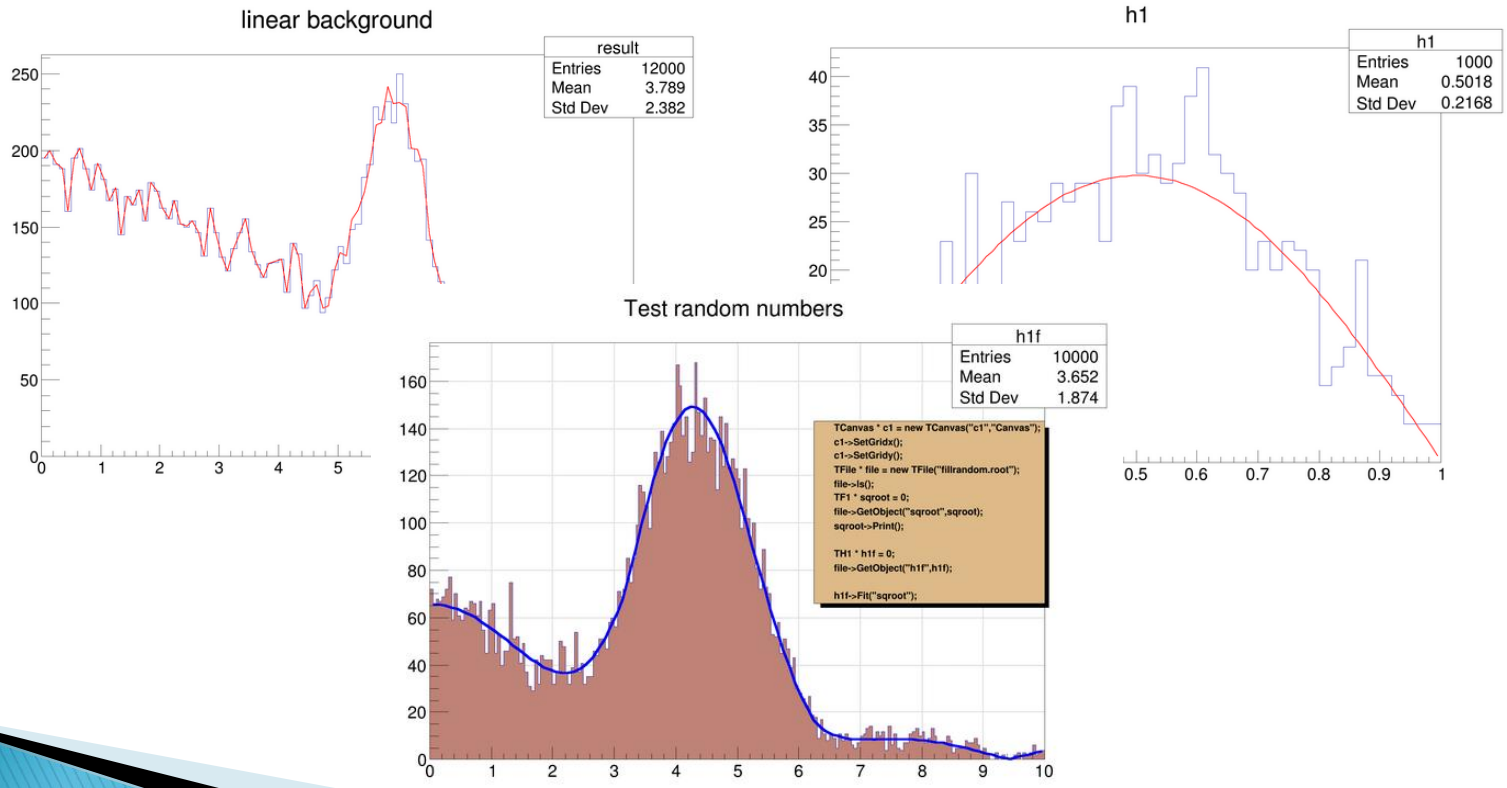
Fitting

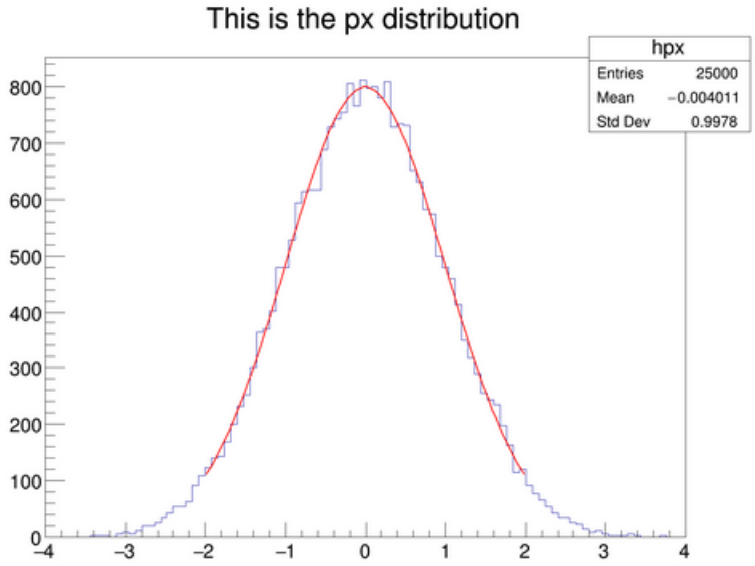
One of the most important features:



Fit Panel…

…is a GUI, which can use all the power of ROOT Fitting tools and interactively fit histograms.

- Predefined or User Function
- Draw Options
- Libraries
- Different Minimization Methods
- Range
- Print Options



ROOT7 version

Intends to implement the ROOT fit panel for web browsers

- Web based (C++ server side and JS client side)
- Modern and user friendly
- Similar design with the previous fit panel
- OpenUI5 libraries for controls (Buttons, Boxes, etc)

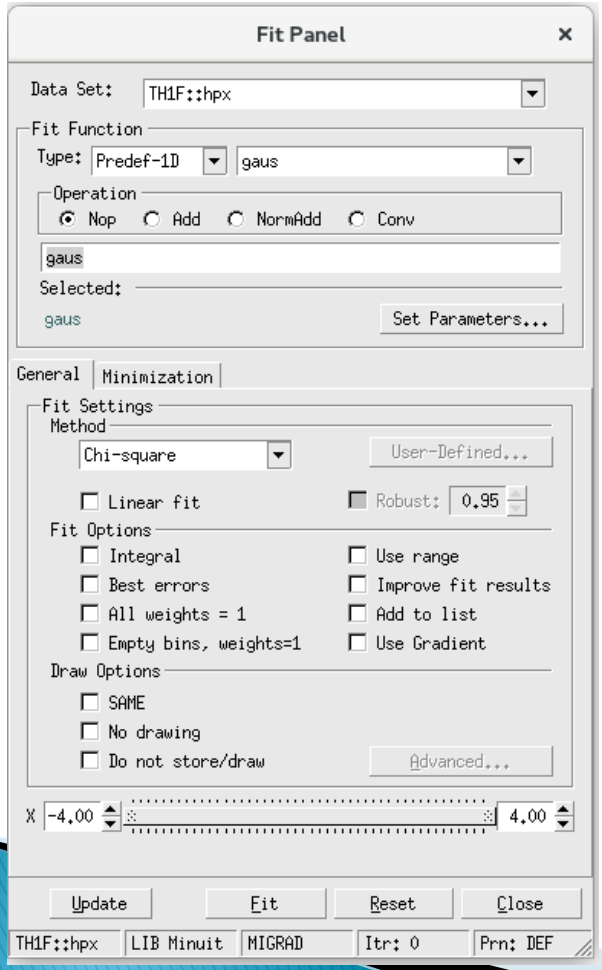
Although we still using from ROOT6:

- Canvas
- Histograms
- Fit Functionality

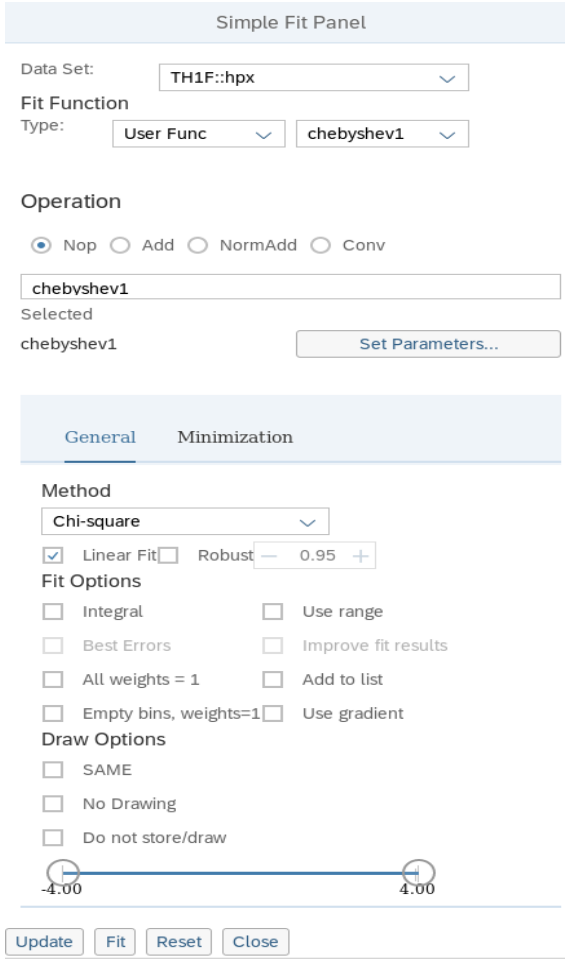
…one of our basic goals for the next mid-term is the implementation of all these on ROOT7.

ROOT7 version

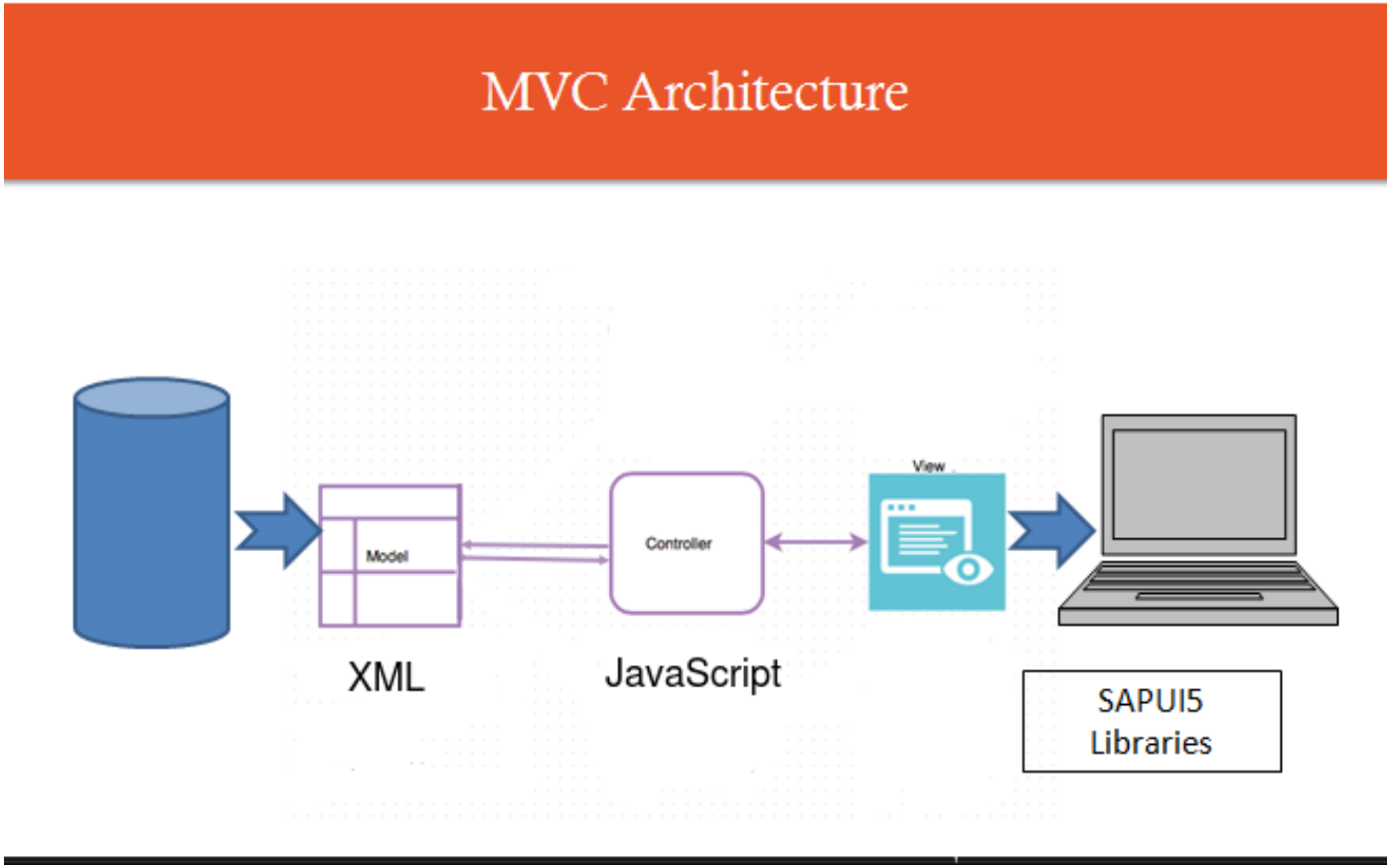
Before



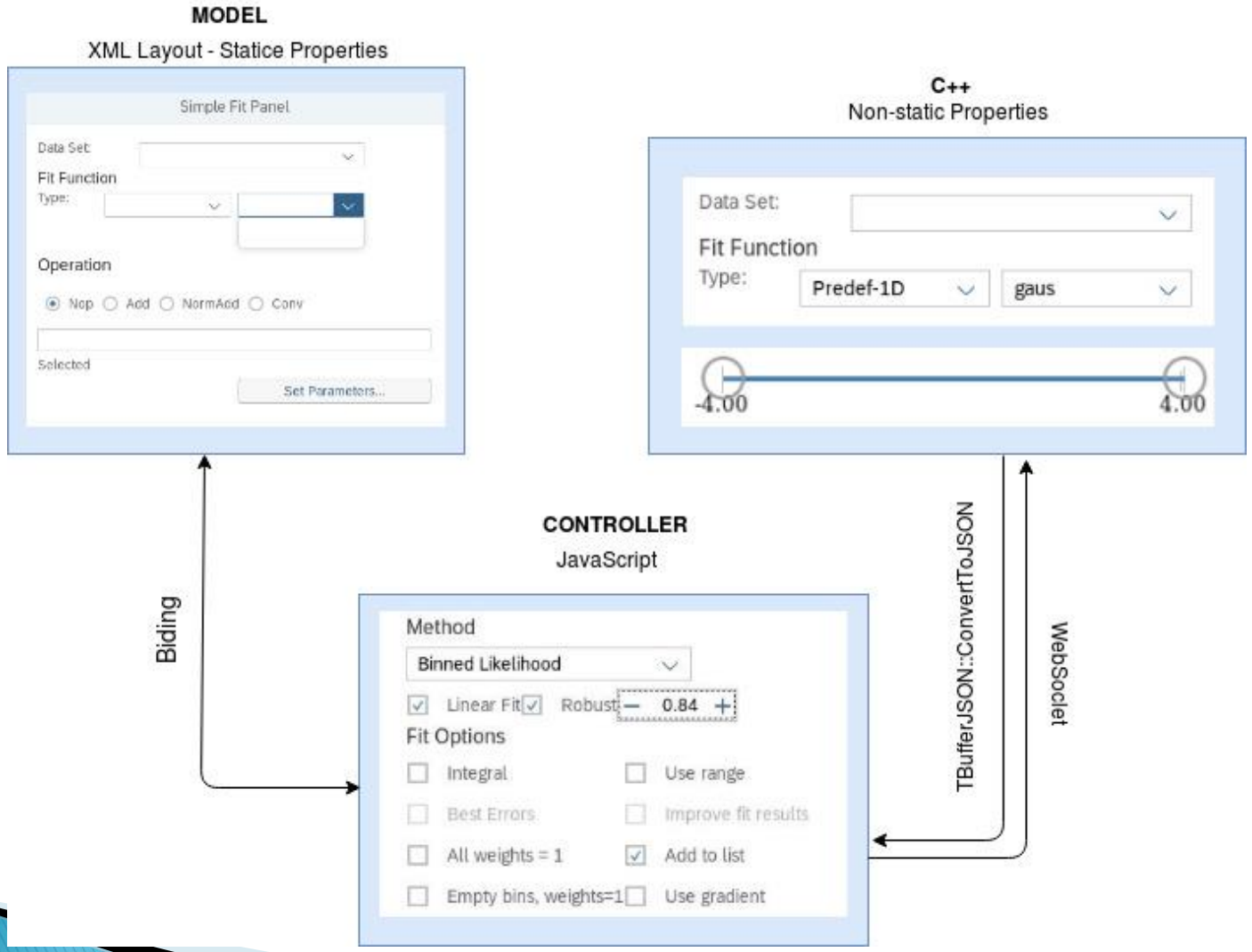
After



How it's working (1/2)



How it's working (2/2)



OpenUI5

OpenUI5 is the new technology we have used to design the new version of the Fit Panel. It is a JavaScript UI library consisting of a really large number of UI controls, we are using.

The Fit Panel Layout (1 /4)

The containers:

- Vbox

```
<VBox
  class="sapUiSizeCompact">
```

- Toolbar

```
<Toolbar>
```

- Form

```
<form:layout>
  <form:ResponsiveGridLayout/>
</form:layout>
```

- Horizontal Layout

```
<l:HorizontalLayout>
</l:HorizontalLayout>
```

- Vertical Layout

```
<l:VerticalLayout>
</l:VerticalLayout>
```

- LayoutData

```
<layoutData></>
```

The Fit Panel Layout (2/4)

The controls:

- ComboBox

- RangeSlider

- RadioButton

- CheckBox

The Fit Panel Layout (3/4)

We need more compact design:

Compact Layout: for achieving a compact layout we are using:

- Forms
- GridData
- Compact Class

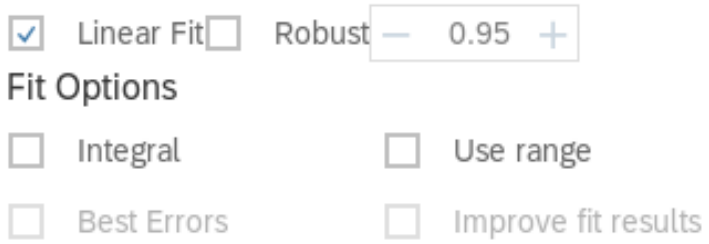
```
<VBox class="sapUiSizeCompact">
```

The Fit Panel Layout (4/4)

Binding: We are using data binding to communicate with the client.

```
<RadioButtonGroup selectedIndex="{/fOperation}">
  //the selected value from the RadioButtonGroup is stored
    in fOperation
```

```
<CheckBox text="Best Errors" selected="{/fBestErrors}"
enabled="{= ${/fLinear} !== true}"/>
  // the checkbox is enabled only if Linear Fit option is not
    selected(false)
```



Server Side in C++ (1/3)

- Structures for most complicated controls (ComboBox)

```
struct ComboBoxItem {
  std::string fId;
  std::string fSet;
  ComboBoxItem() = default;
  ComboBoxItem(const std::string &id, const
      std::string &set) : fId(id), fSet(set) {}
};
```

Server Side in C++ (2/3)

- FitPanelModel Structure with the definition of all types

```
struct FitPanelModel {
  std::vector<ComboBoxItem> fDataSet;

  std::string fSelectDataId;
  float fMinRange{0};
  bool fLinear{false};
  int fLibrary{0};
  bool fBestErrors {false};
};
```

Server Side in C++ (3/3)

- We give values to the parameters in our model follow the structure we have defined before.

```
FitPanelModel model;

//ComboBox for Data Set
model.fDataSet.push_back(ComboBoxItem("1", "No Selection"));
model.fDataSet.push_back(ComboBoxItem("2", "TH1F::hpx"));
model.fDataSet.push_back(ComboBoxItem("3", "TH2F::hpxhpy"));

model.fSelectDataId = "2";
model.fMinRange = -4;
model.fLinear = true;
model.fLibrary = 0;
model.fBestErrors = false;
```

Communication between C++ and JavaScript

- The communication between the server side and the client side

```
TString json = TBufferJSON::ConvertToJSON(&model,
  gROOT->GetClass("FitPanelModel"));
fWindow->Send(fConnId, std::string("MODEL:") +
  json.Data());
```

TBufferJSON::ConvertsToJSON() -› converts an object to JSON string

Client Side on JavaScript

- Function for the communication with the server, OnWebSocketMessage

```
OnWebsocketMsg: function(handle, msg){
   if(msg.indexOf("MODEL:")==0){
       var json = msg.substr(6);
       var data = JSROOT.parse(json);

   if(data) {
       this.getView().setModel(new JSONModel(data));
       this._data = data; }
   }
   else { }
},
```

Fit Function on Client Side

- Button on the layout

```
doFit: function() {

   var data = this.getView().getModel().getData();
   //We get the value from the ComboBox for the function and store it func.
   var func = this.getView().byId("TypeXY").getValue();
   //We pass the value from func (JavaScript Side) to fRealFunc(C++ Side).
   data.fRealFunc = func;

   var range = this.getView().byId("Slider").getRange(); data.fRange[0] =
     range[0]; data.fRange[1] = range[1];

   //Refresh the model
   this.getView().getModel().refresh();

   if (this.websocket)
     this.websocket.Send('DOFIT:'+this.getView().getModel().getJSON());
},
```

Fitting Function on C++ (1/2)

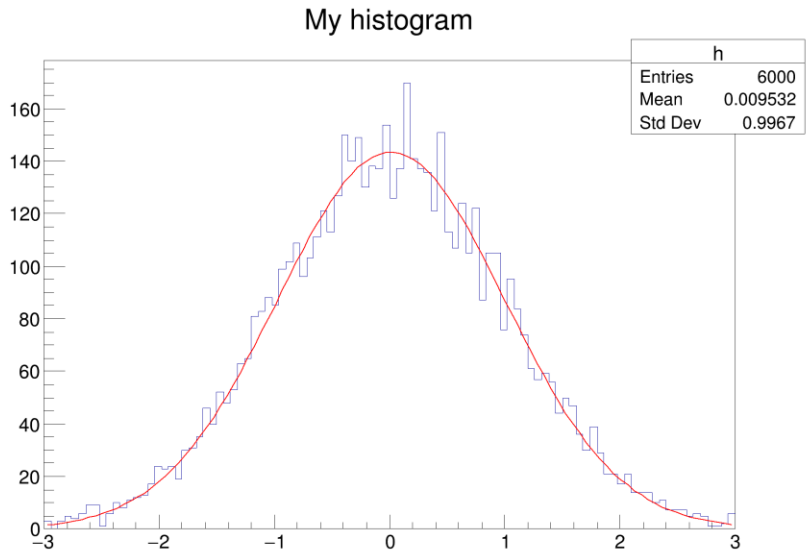
- First we edit the selected values from the user, so that they are in the right form

```
if (obj) {
   if (!obj->fRealFunc.empty()) {
     printf("GOT fRealFunc: %s\n", obj->fRealFunc.c_str()); }
   else { obj->fRealFunc = "gaus";
     printf("%s\n", obj->fRealFunc.c_str()); }
   if(obj->fIntegral){
     obj->fOption = "I"; }
   else if(obj->fBestErrors){
     obj->fOption = "E"; }
   else {
     obj->fOption = ""; } }
   }
```

Fitting Function on C++ (2/2)

- We assign the edited values to fit function and update

```
if (fHist) {
   fHist->Fit(obj->fRealFunc.c_str(), obj->fOption.c_str(), "*",
     obj->fRange[0], obj->fRange[1]);
   gPad->Update(); }
}
```



Create Window in C++

```
void Show(const std::string &where = "") {

fWindow =ROOT::Experimental::TWebWindowsManager::Instance()
  ->CreateWindow(false);

//defines the OpenUi5 element which will run on client-side
fWindow->SetPanelName("localapp.view.SimpleFitPanel");

//receive the model via WebSocket
fWindow->SetDataCallBack([this](unsigned connid, const
  std::string &arg) { ProcessData(connid, arg); });

//configure predefined geometry
fWindow->SetGeometry(450, 550);
fWindow->Show(where);

//instead showing of window just generate URL, which can be copied
  into the browser
std::string url = fWindow->GetUrl(true);
printf("Example: %s\n", url.c_str()); }
```

Future Work

- There are a few things that still missing from the new version of Fit Panel and will be completed in the next months.

  - Reset/Update functions
  - Functionality of some controls
  - Functions defined by the user
  - Functionality of Libraries and Methods

BACK UP SLIDES

- Dependant Combo Boxes,
  Layout with code,
  Controls with code

The Fit Panel Layout (2/4)

The controls:

- ComboBox

```
<ComboBox id="DataSet" selectedKey="{/fSelectDataId}"
items="{ path: '/fDataSet', sorter: { path: 'fSet' } }">
        <core:Item key="{fId}" text="{fSet}" />
</ComboBox>
```

- RadioButton

```
<RadioButton id="RB1-1" text="Nop"/>
```

- CheckBox

```
<CheckBox id="Integral" text="Integral"/>
```

- RangeSlider

```
<RangeSlider id="Slider" range="{/fRange}"
  min="{/fMinRange}" max="{/fMaxRange}" step="{/fStep}"/>
```

Functions for handling the values

- The selected function from the ComboBox appears directly on the TextArea.

```
onTypeXYChange: function(){
  var data = this.getView().getModel().getData();
  var linear = this.getView().getModel().getData().fSelectXYId;
  data.fFuncChange = linear;
  this.getView().getModel().refresh();

  //updates the text area and text in selected tab, depending on
  the choice in TypeXY ComboBox
  var function = this.getView().byId("TypeXY").getValue();
  this.byId("OperationText").setValueLiveUpdate();
  this.byId("OperationText").setValue(function);
  this.byId("selectedOpText").setText(function);
},
```

Dependent ComboBox (1/2)

There are some ComboBoxes which values are dependant from the selection of a previous control.

- Definition:

```
std::vector<std::vector<ComboBoxItem>> fMethodMinAll;
```

Dependent ComboBox (2/2)

- We give the values:

```
// corresponds to library == 0
model.fMethodMinAll.emplace_back();
std::vector<ComboBoxItem> &vect0 = model.fMethodMinAll.back();

vect0.push_back(ComboBoxItem("1", "MIGRAD"));
vect0.push_back(ComboBoxItem("2", "SIMPLEX"));

// corresponds to library == 2
model.fMethodMinAll.emplace_back();
std::vector<ComboBoxItem> &vect2 = model.fMethodMinAll.back();
vect2.push_back(ComboBoxItem("1", "FUMILI"));
```