Interactive Web-based Analysis
Clients using AJAX: examples for CMS, ROOT and GEANT4

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What is AJAX?
What AJAX is not...
What AJAX is not...
What AJAX is not...
Asynchronous Javascript And XML
**AJAX**

AJAX is a buzz-word used to indicate a set of techniques and programming patterns, involving Javascript and XML, which allow to create web applications that give the same feel and responsiveness of traditional desktop applications.
Traditional web pages workflow

The client does an HTTP GET Request to the server

Client

HTTP GET Request

Server

--- --- --- --- --- --- --- --- --- --- --- --- time
Traditional web pages workflow

The server constructs the full web page

Client

Server
Traditional web pages workflow

The full page is sent...

Client

Server

---

time
Traditional web pages workflow

...and processed by the client...

Client

Server

http://iguana.web.cern.ch
Traditional web pages workflow

If the complete web page is complex enough, a big interval of time intercours between request for a page and its actual availability to the user.
Traditional web pages workflow

moreover the user cannot use the web page until fully loaded.

Period the web page is unavailable to the user
AJAX

The client does an HTTP GET Request to the server

Client

Server

time
AJAX

The server constructs the minimal web page for the user to start browsing

Client

Server

http://iguana.web.cern.ch
AJAX

The minimal page is sent

Client

Server

---

time
The client processes the web page
...if (and only if) more information is requested by the user....

AJAX
AJAX

a new request for DELTAs is done

XMLHttpRequest

Client

Server

time
AJAX

the server processes the request and decides what has changed

Client

Server

Server processing deltas
AJAX

response is given formatting delta into XML
AJAX

the delta is processed asynchronously using javascript
AJAX

and the page is finally updated

Client

Server

Page update

time
iterate on new user’s requests

Client

Server

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The AJAX advantage

Client

Server

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The AJAX advantage

LOW LATENCY!

Client

Server

time

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The AJAX advantage

Reduced time the web page is not available

Client

Server

time
The AJAX advantage

On update only deltas are sent

![Diagram showing data sent over time for traditional and AJAX methods.](chart.png)
IGUANA and AJAX
Interactive Graphics for User Analysis
IGUANA object model and visualization toolkit

Data sources

- Offline software
- Online software
- Data Quality Monitoring
- G4

http://iguana.web.cern.ch
IGUANA object model and visualization toolkit

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IGUANA Web Services  IGUANA Javascript GUI library  IGUANA embedded HTTP/1.1 server  IGUANA Web Services Framework

QT  Open Inventor  ROOT
**G4 Visualization**

Tree browser with the full G4 description of CMS, as found in the old OSCAR simulation program.

Live, navigable by mouse dragging 3D window.

Does not require any plugin.

Framework controller.

Panning and zooming controllers.
CMS offline software

Getting ready for CMS cosmic challenge

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Generic DQM GUI

QT & ROOT
Generic DQM GUI

CMS Interactive Web Interface (powered by IGUANA)

Tree Browser
- / ✓
- Subscribed ✓
- Available ✓
- Collector ◯
- FU0 ◯
- C1 ◯
- C2 ◯
- s1 ◯
- int1 ◯
- histo6 ◯
- histo5 ◯
- histo4 ◯
- histo3 ◯
- float1 ◯
- histo2 ◯
- histo ◯
- updchart ◯
- FU0_updel ◯
- FU0_size ◯

My subscription

AJAX&ROOT
Generic DQM GUI

The two implementations share most of the code!!

AJAX allows to have the same behaviour of desktop and web applications.

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Generic DQM GUI

 QT GUI and controls

 QT Tree Model

 Root Model

 Internal object representations

 Controller

 DQM Services
Generic DQM GUI

- QT GUI and controls
- QT Tree Model
- Root Model
- XML Tree Model
- Internal object representations
- Controller
- JAVASCRIPT GUI
- IGUANA Web Services for controls
- DQM Services
MC Request system

Javascript generated GUI with connection to backend DBs via CORAL
MC Request system

Tree widget populated on the fly with requests from the request DB.

Actions performed by the toolbars and menus are lazily loaded only when clicking.
Google Map
Tracker Map

CMS Interactive Web Interface (powered by IGUANA)
Final words
AJAX recap

- AJAX breaks the GET/DISPLAY/RELOAD paradigm used by standard web pages.
- In AJAX web applications data is transferred a little bit at the time in small chunks, when the user requests for it.
- The updates of web pages are asynchronous and happen without touching what the user sees until the end.
- It allows complex, interactive, low latency web applications, without the need for external plugins or JAVA virtual-machine (JAVASCRIPT is not related to JAVA !!!)
IGUANA and AJAX

IGUANA provides a framework for creating AJAX applications and has examples for a variety of tasks CMS, ranging from event display to data quality monitoring to MC request system.
Who else uses AJAX

There are a few “startups” ;) that are using AJAX techniques more and more as well...
Who else uses AJAX

There are a few “startups” ;) that are using AJAX techniques more and more as well...

http://iguana.web.cern.ch
Who else uses AJAX

- There are a few “startups” :) that are using AJAX techniques more and more as well...
and a few others...