Web based Event Display server for MPD/NICA experiment

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Abstract:

▸ Modern experiments in nuclear physics last for years and require enormous human and energy resources.

▸ There are various methods for monitoring engineering, network and computer systems of the experiment. As a rule, they have a common name for all - the Event Display and include a whole range of monitoring and control systems.

▸ Modern technologies make it possible not to take into account the platform and type of operating system on which the Internet browser is launched. A program written in JavaScript will execute in the same way on every platform, including mobile devices with Internet access.
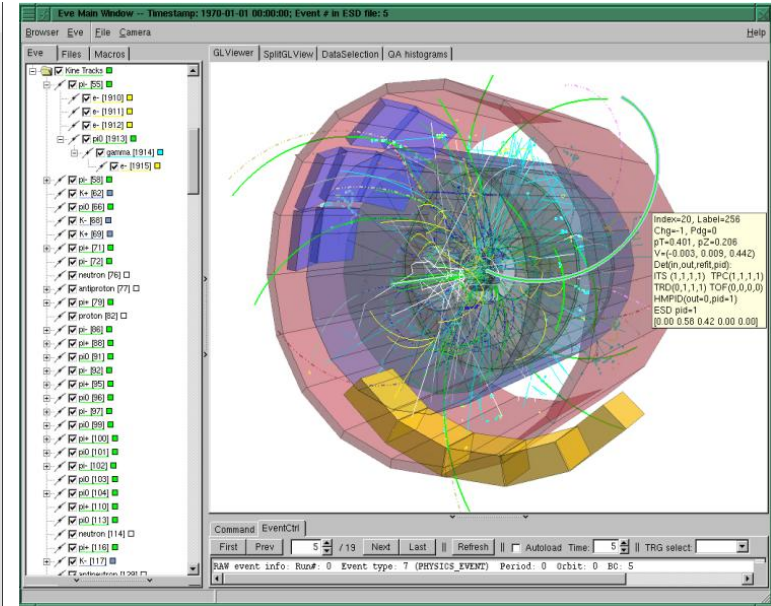
Event displays based on OpenGL

▸ Event Displays originally based on ROOTEVE library (OpenGL)
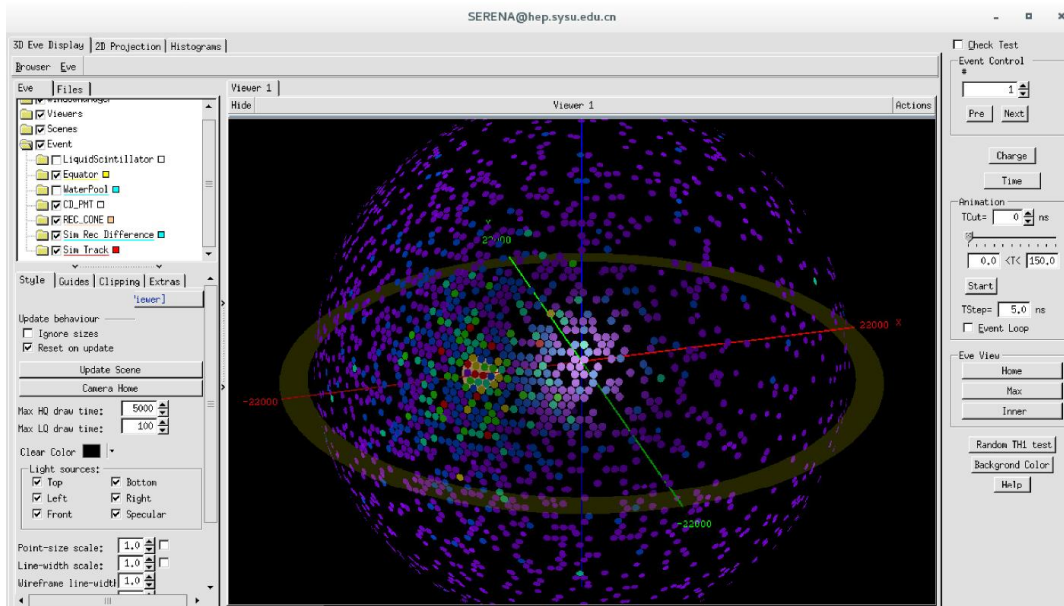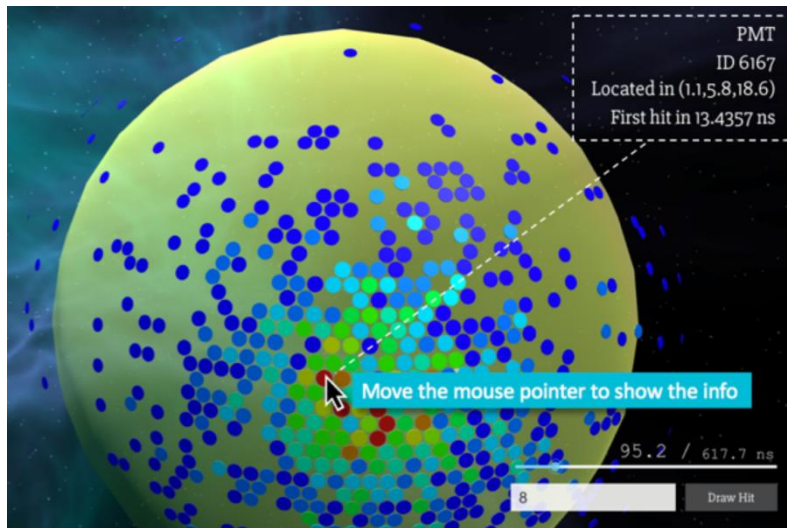

JUNO
[J. Phys.: Conf. Ser. 1085]

ALICE
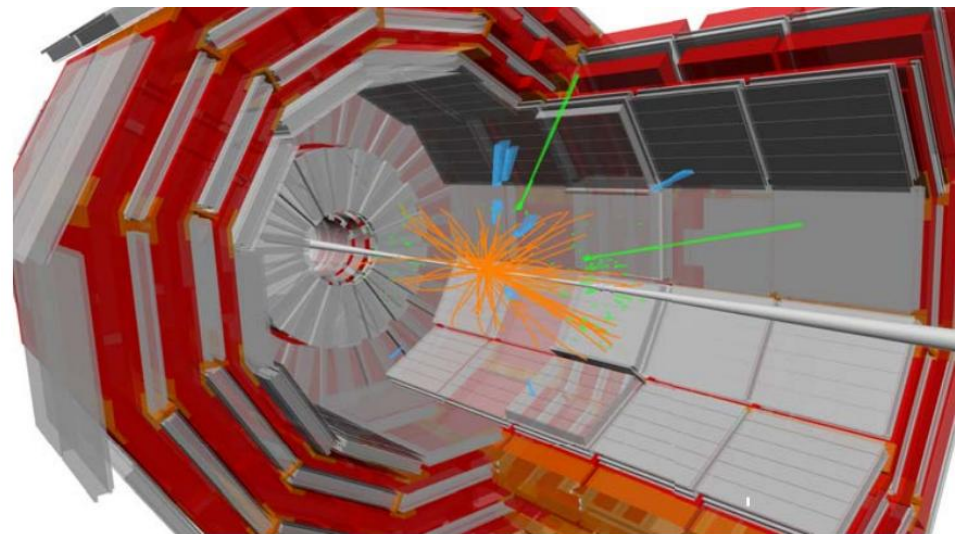[J. Phys.: Conf. Ser. 219]

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Event displays based on WebGL

- Other Event Displays based on Unity (JUNO) or ThreeJS (CMS)

JUNO

[J. Phys.: Conf. Ser. 1085]

CMS (iSpy)

[J. Phys.: Conf. Ser. 898]

Modern Web Technologies

- JavaScript Engine V8 (https://v8.dev/)

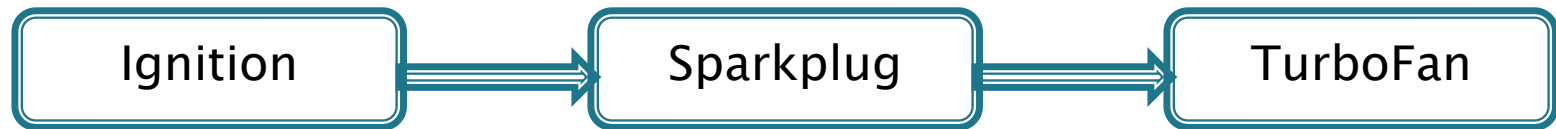- React framework (https://reactjs.org/)

- WebGL

- NodeJS (https://nodejs.org/en/)

JavaScript

JavaScript is a front-end scripting programming language that's mostly used for web development.

It was developed by Brendan Eich in 1995 while working for Netscape Communications.

JavaScript Engine V8 compiler pipeline since **May 2021**

Ignition	→	Sparkplug	→	TurboFan

- Ignition – interpreter translate JavaScript to intermediate byte code;
- Sparkplug – none-optimizing compiler from byte code to native machine code;
- TurboFan – highly optimizing compiler.

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Modern JavaScript Frameworks

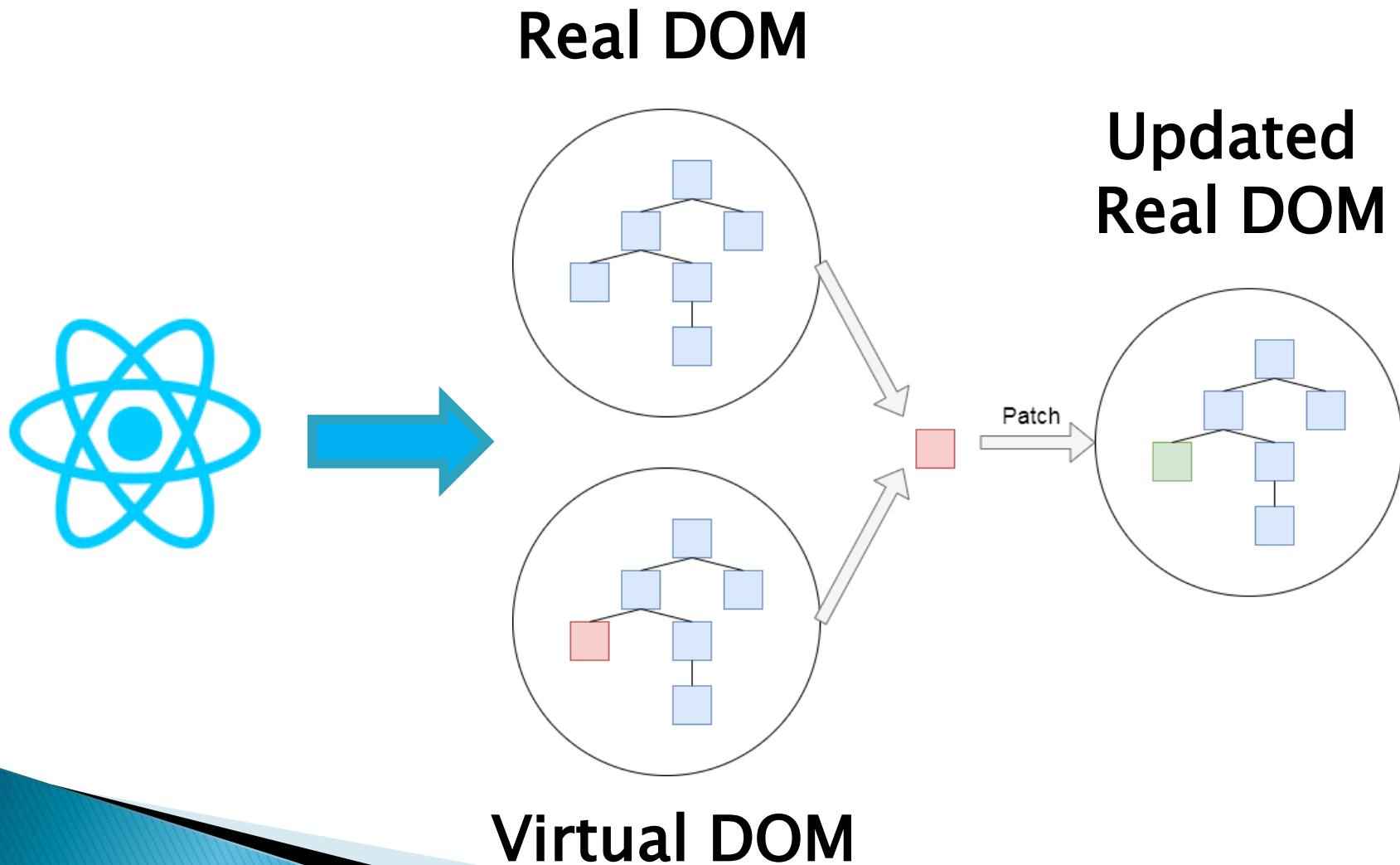**Angular**, developed by Google, was first released in 2010;

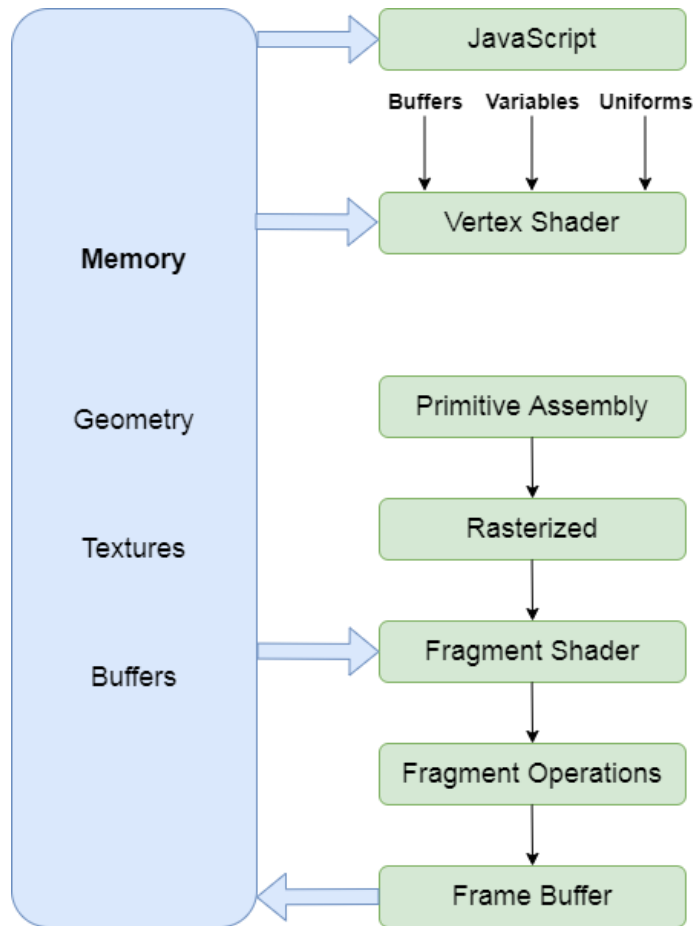**React**, developed by Facebook, was initially released in 2013;

Vue, also known as Vue.js, is the youngest member of the group. It was developed by ex-Google employee Evan You in 2014.
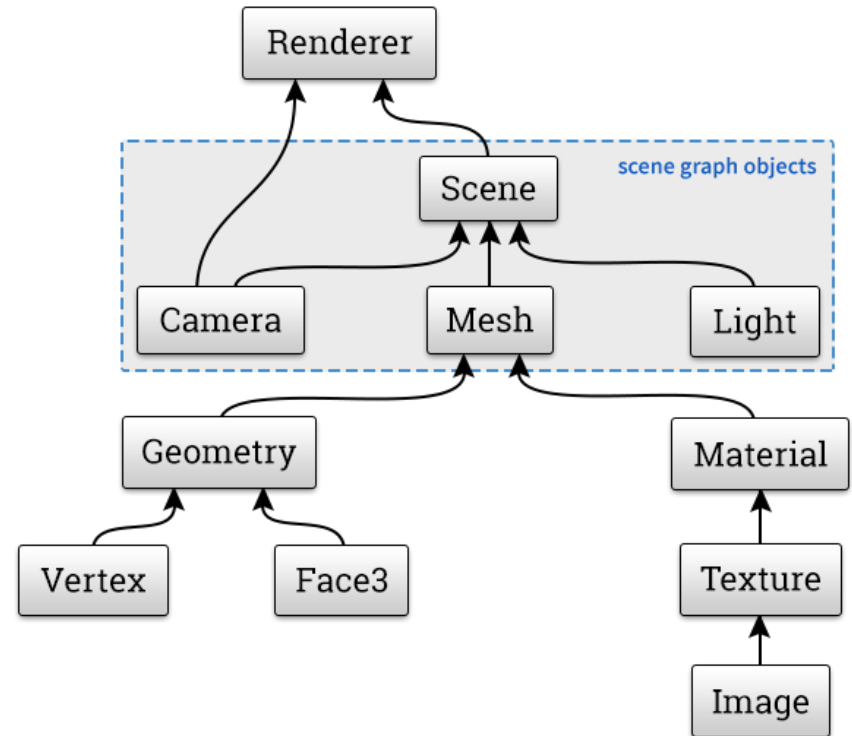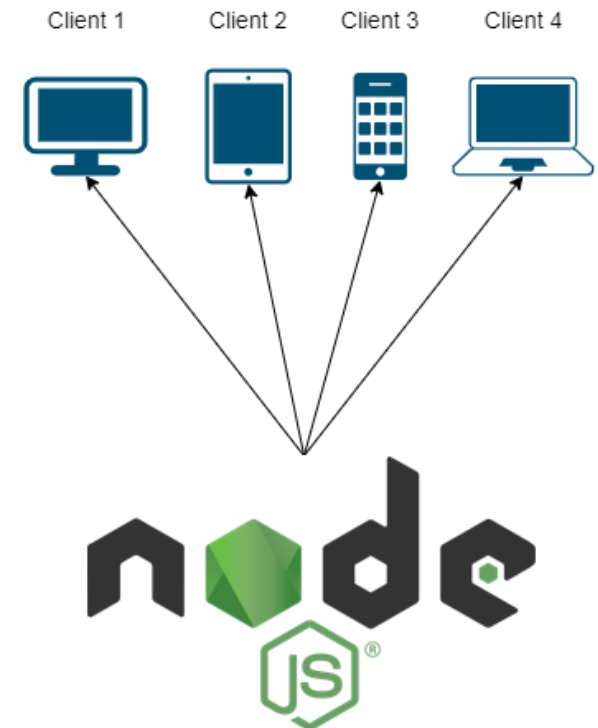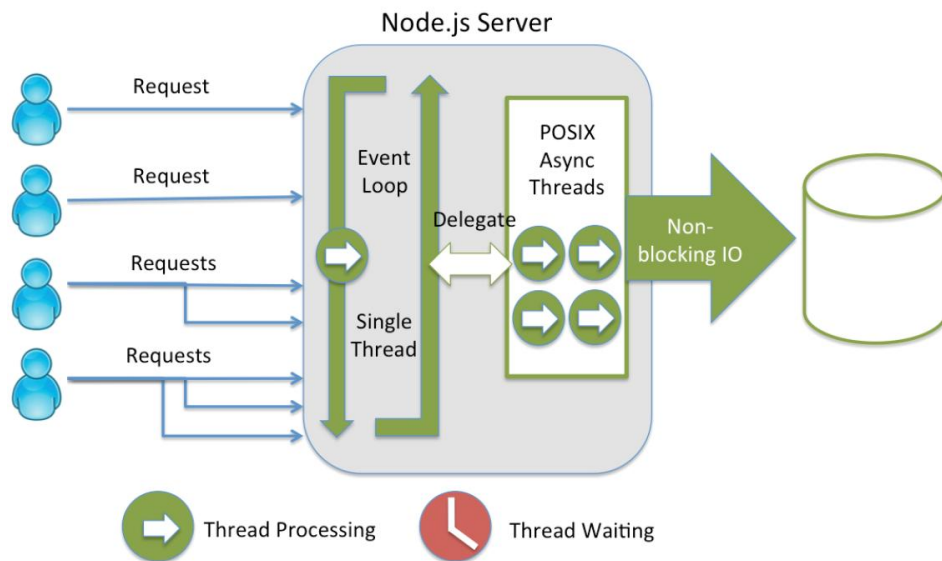
React Framework features

Real DOM

Updated
Real DOM

Virtual DOM

Patch

WebGL and ThreeJS

WebGL pipeline

ThreeJS basic concepts

[Cluster Computing 22(5)]

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NodeJS

NodeJS is a client-server web application runtime environment that runs on the V8 engine.
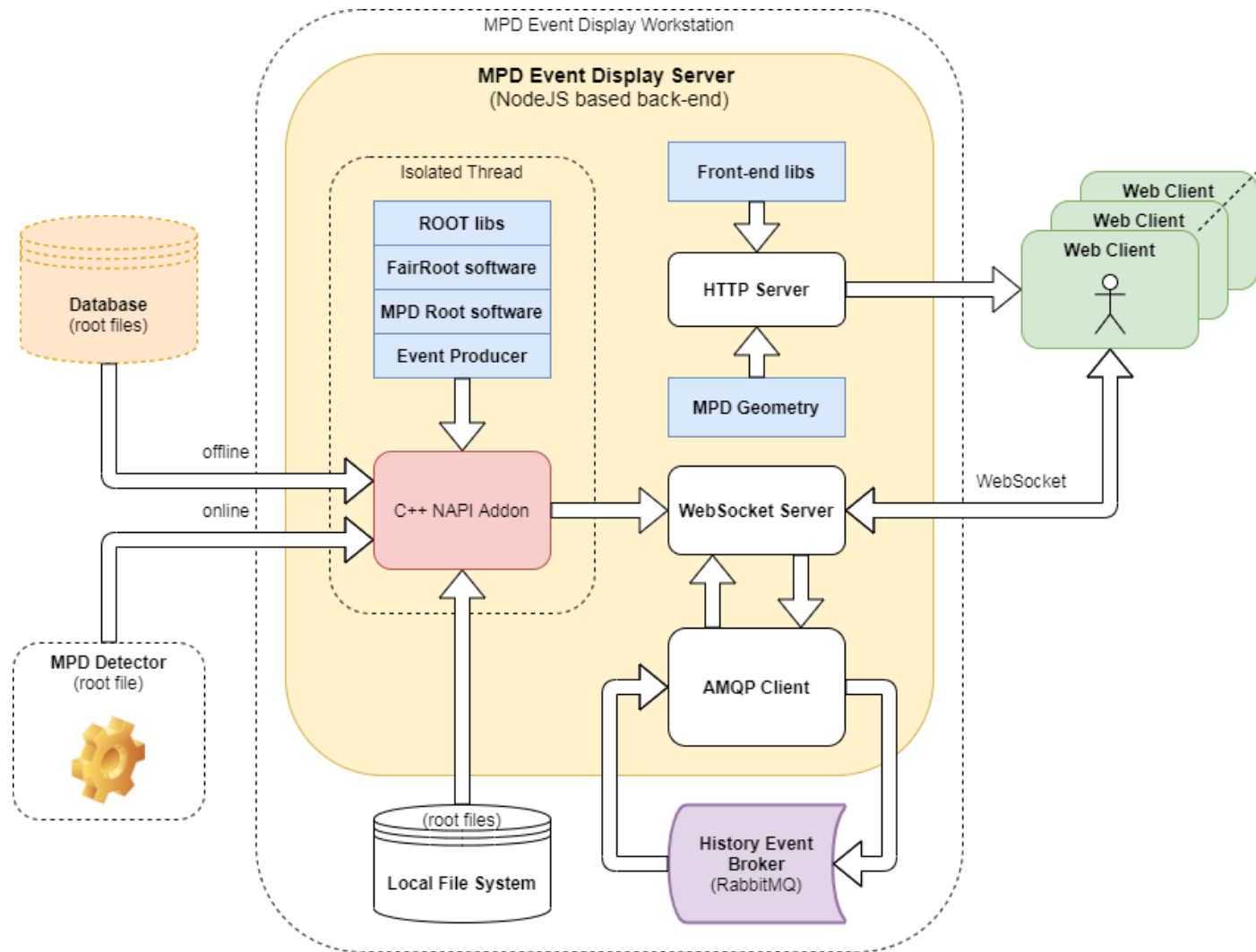
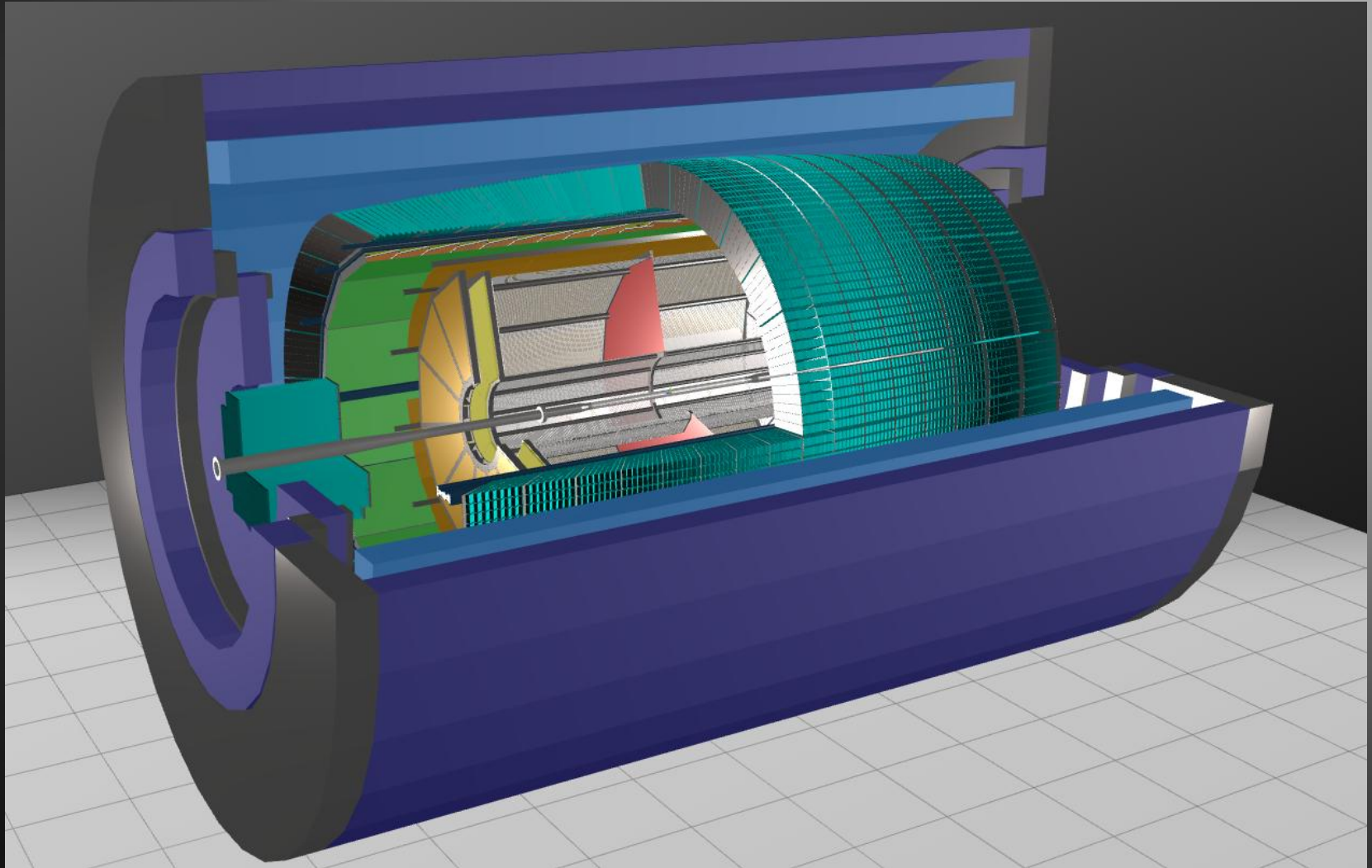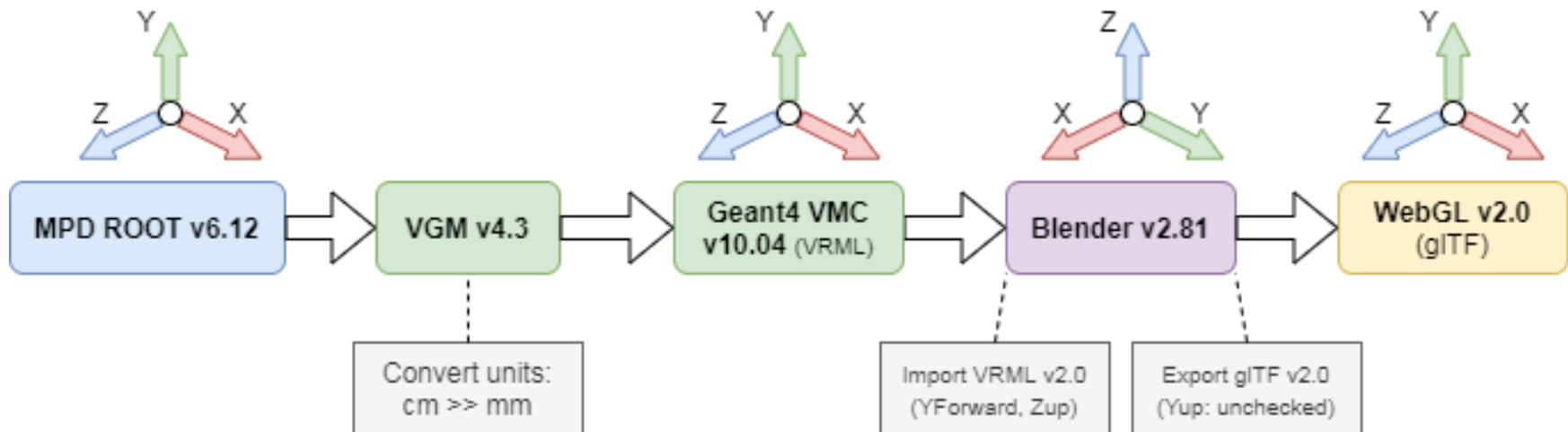**NodeJS** was written by Ryan Dahl in 2009.

NodeJS pipeline

[https://habr.com/ru/post/460661]

Event Display Server data flow

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MPD/NICA experiment

Geometry conversion scheme

MpdRoot - offline software framework for simulation, reconstruction and physics analyses of the simulated or experimental data for MPD experiment;

Virtual Geometry Model (VGM) - geometry conversion tool between Geant4 VMC and ROOT TGeo geometry models;
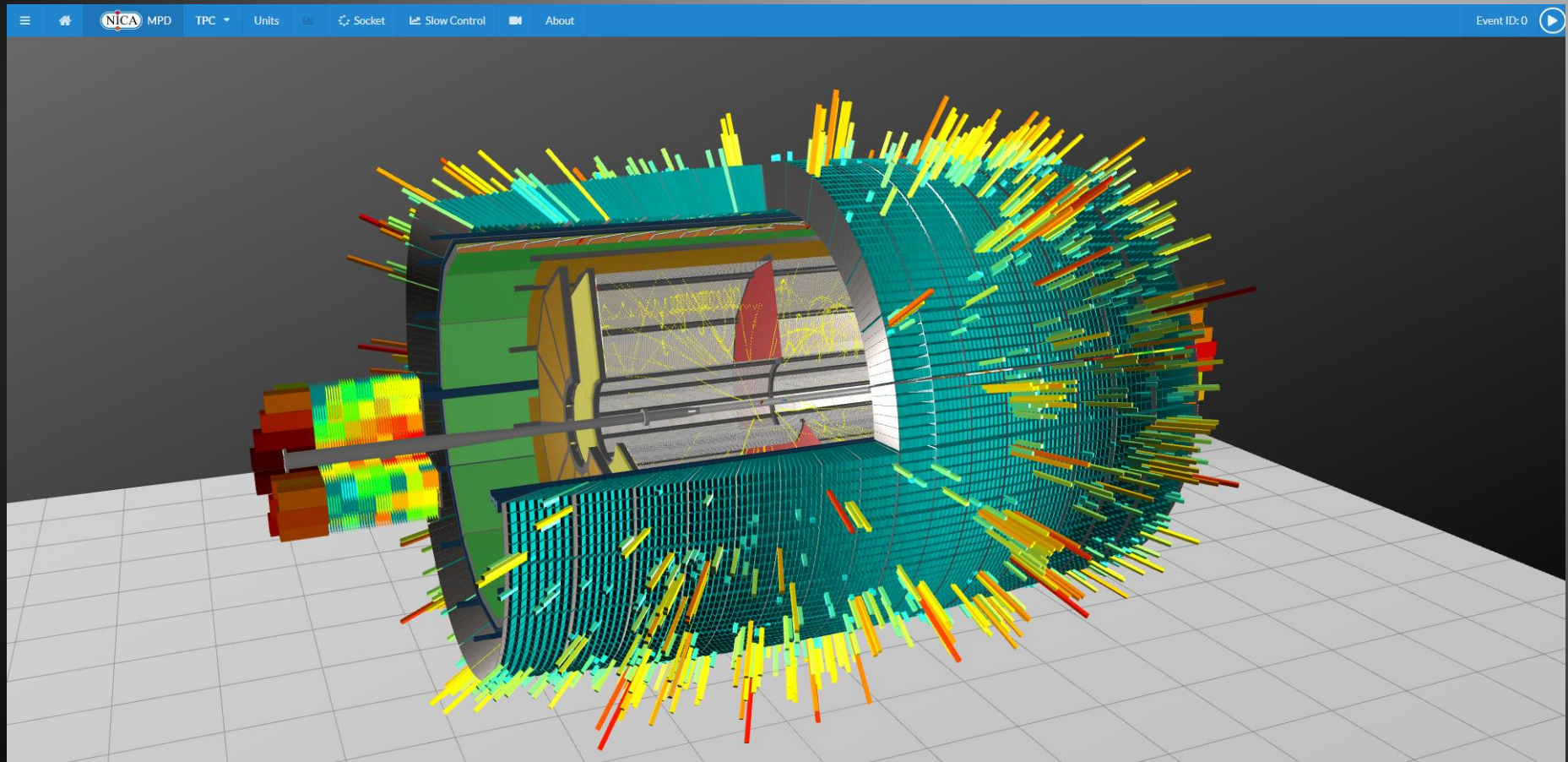
Blender - free and open source 3D creation suite. Starting from v2.81 Blender support plugin for export to **gITF** format;

VRML - Virtual Reality Modeling Language

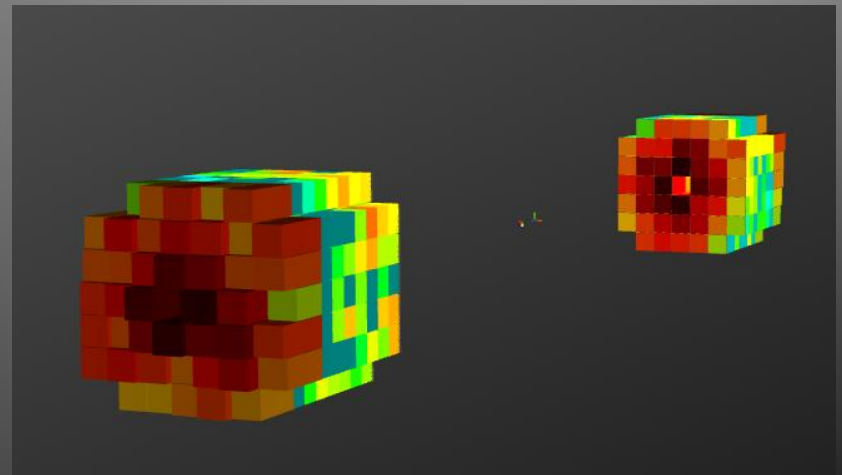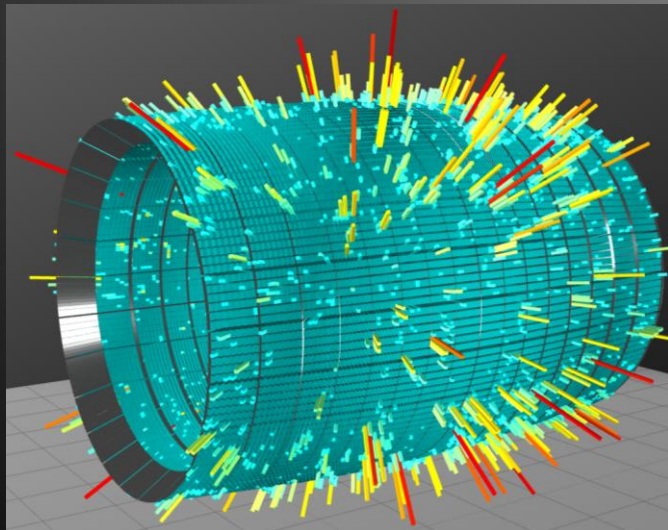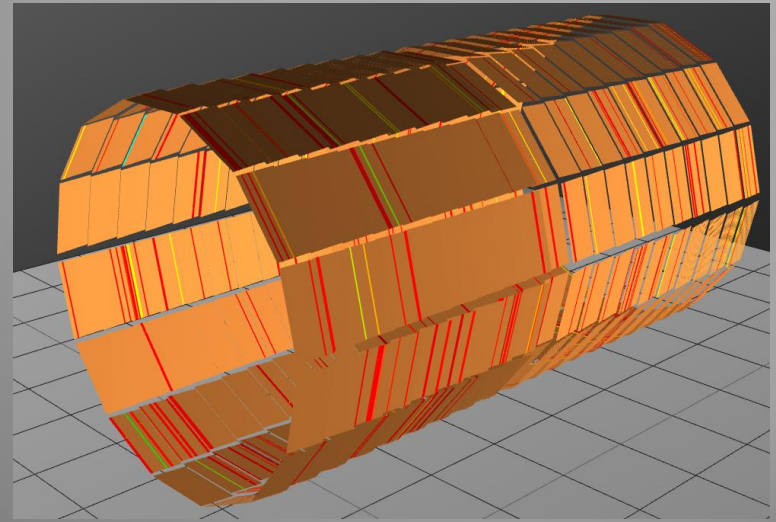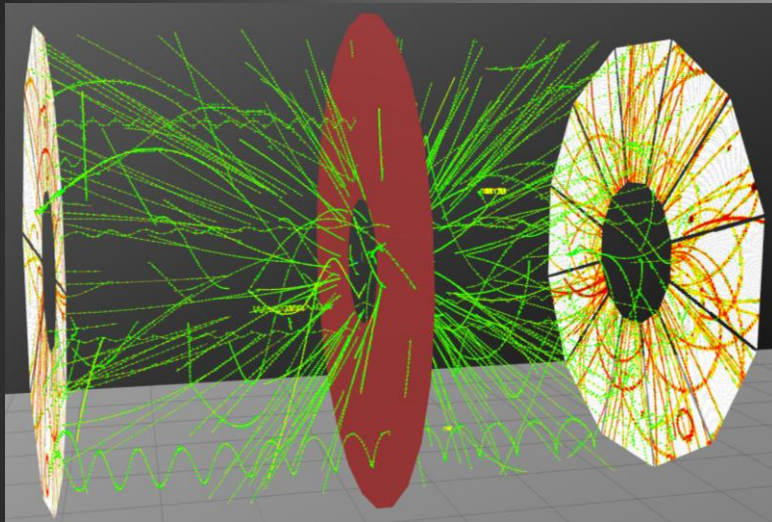**gITF™** - GL Transmission Format from Khronos Group Inc.;

Results

Results

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Conclusions

- The prototype for a web interactive event display for the MPD detector is under development. However, it have already started testing with simulated events;

- MPD Event Display Server has been tested on all major platforms and browsers, including mobile devices.

- The processing and visualization time for events no larger than 10 MB is no more than 1 second, which means that this technology can be used online to monitor the detector's workflow.

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Thank you for your attention!

MPD software team:

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