

Although web applications are common nowadays, it has always been challenging to put user interfaces of industrial control systems on the web. This poster presents the scenarios and the requirements for a large scale deployment of a web solution. We also present two architectures that were investigated, and how one of them is going to be deployed.

## Problem

### Purpose

- Runtime panels accessible from a web browser
- No client installation, no jump over terminal servers
- Reuse standard and turn-key web technologies
- Apply web interaction models to supervision applications

### Scenarios

- Run one panel per user
- View the same panel for many users (read only, with some customisation)
- Engineer panels and scripts
- Embed control system data in standard web pages

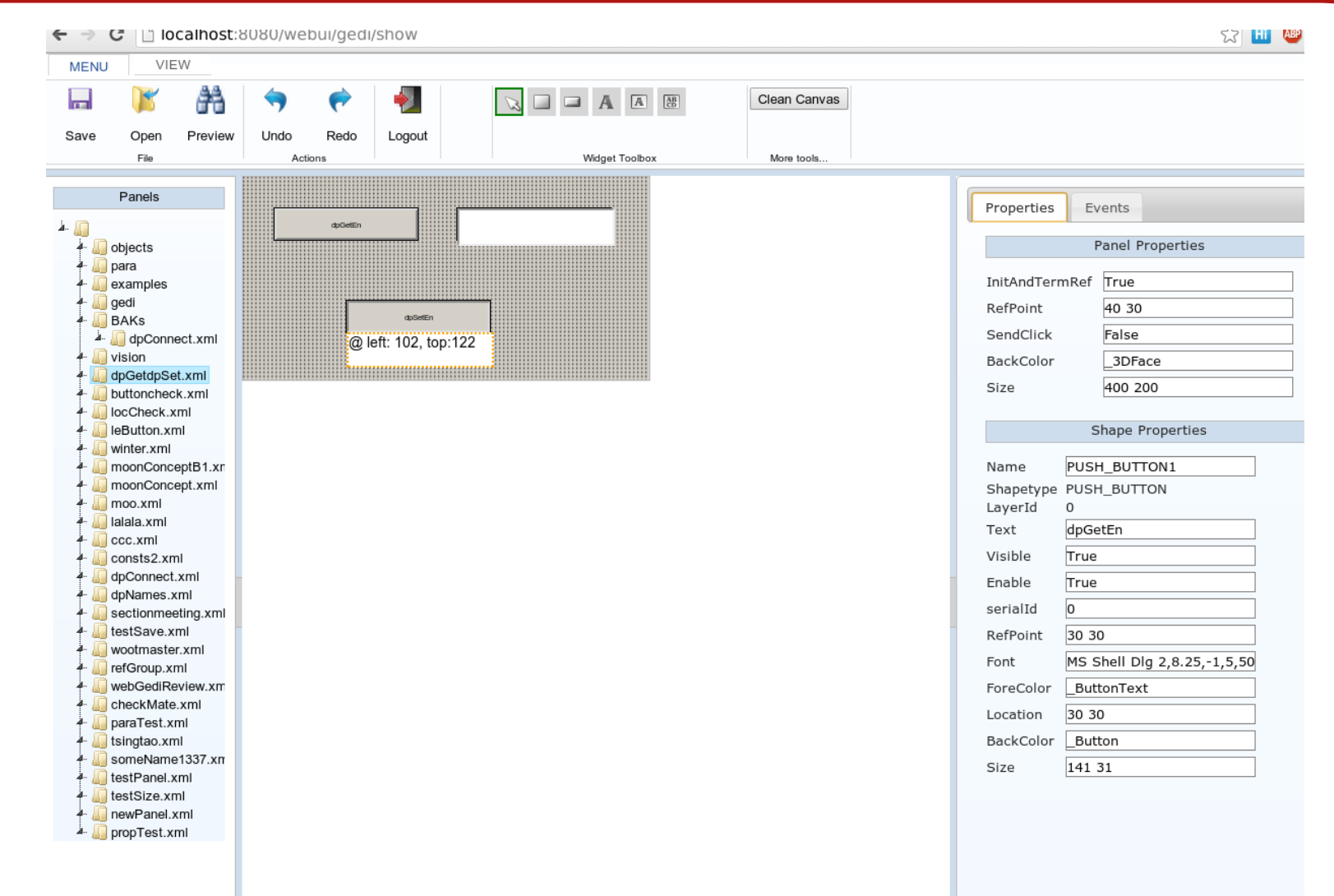
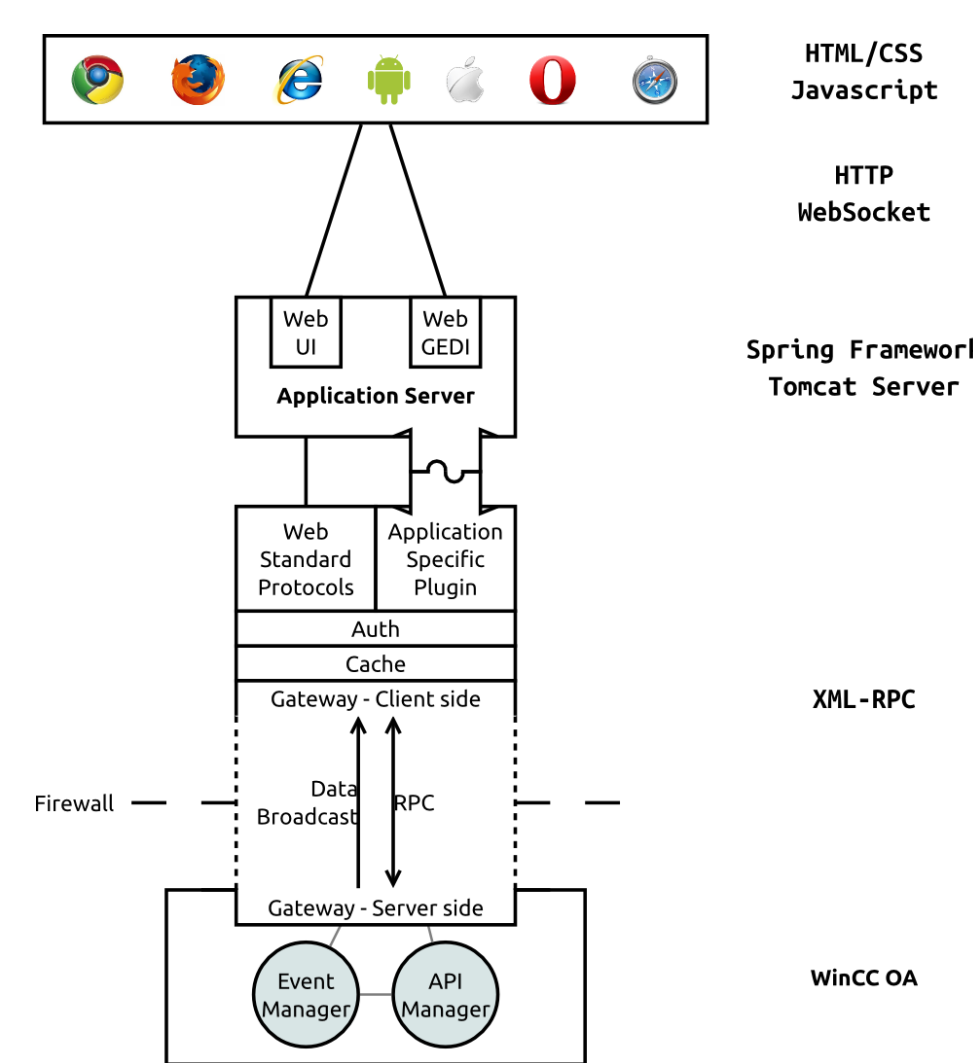
### Challenges

- Security!
- Scale to 1000 clients, connected to 200 systems
- Legacy panels, 15 years of developments
- Integration within enterprise web application servers

## Solutions

### Full Web solution

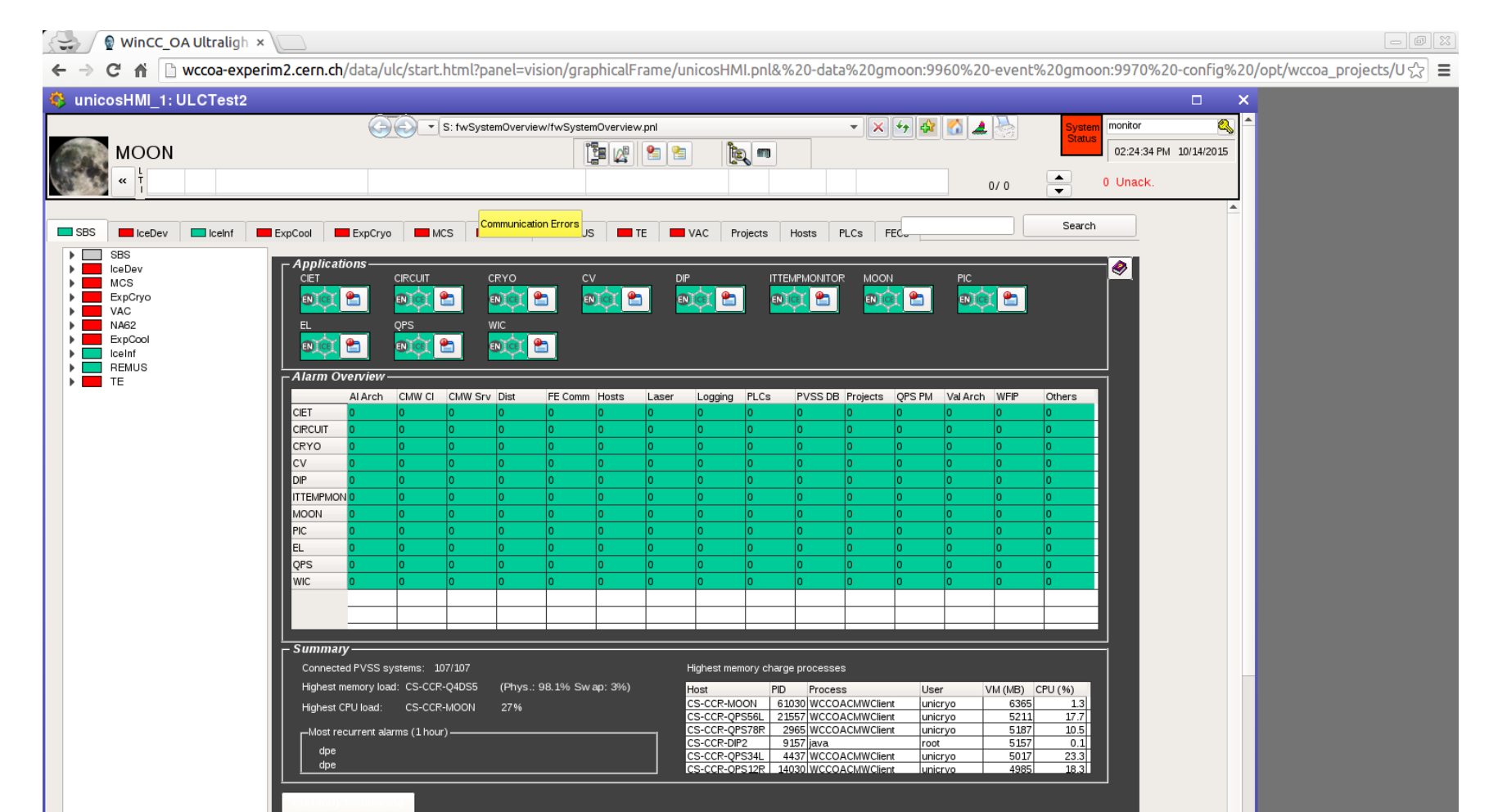
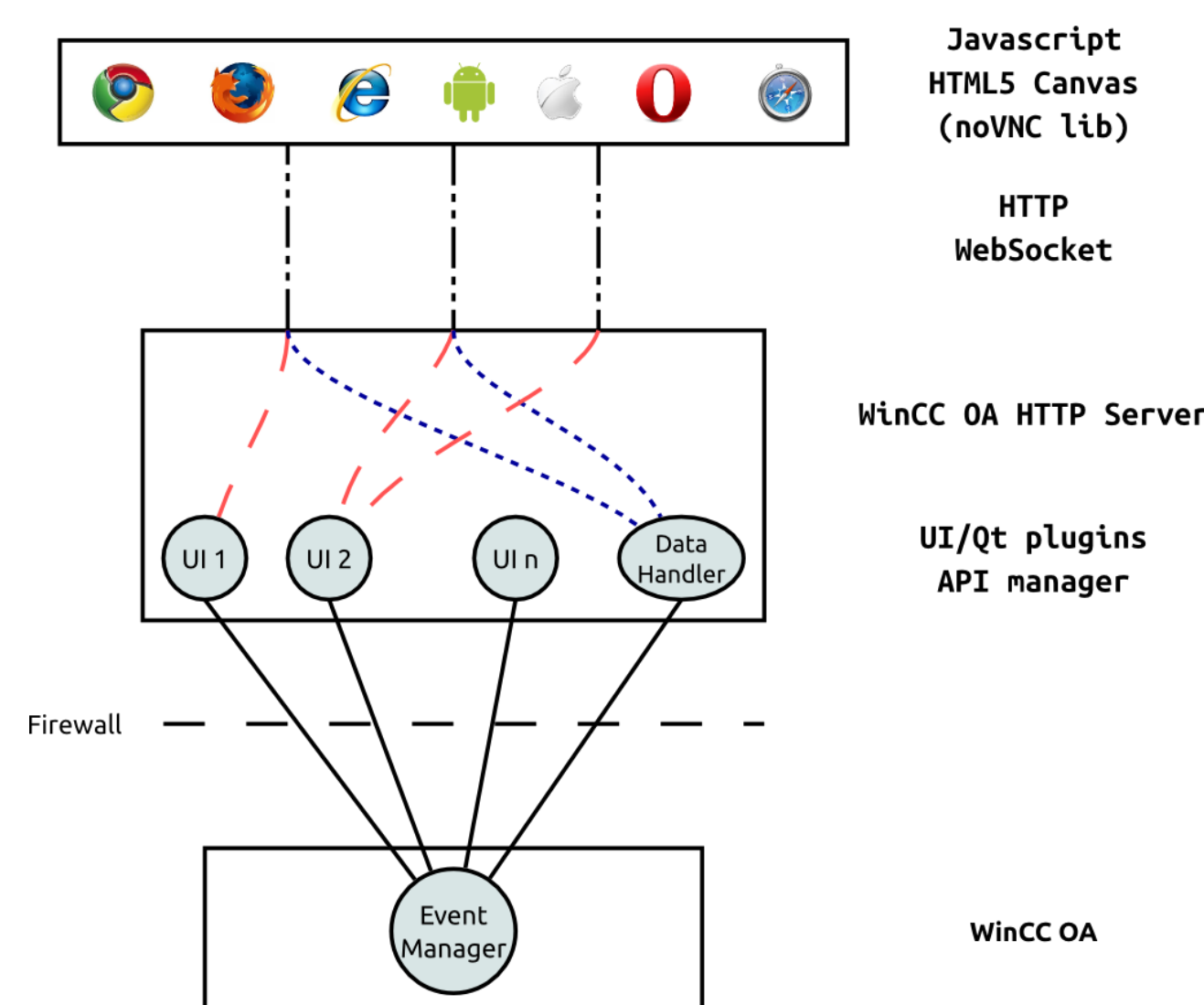
- Conventional dynamic web page generation
- Based on a Spring/Tomcat application server
- Limited by graphic reproduction of panels
- Limited by separating business logic from UI logic



Architecture of the full web solution      Prototype of a full web engineering tool

### VNC-like solution

- Native UI processes run on server side
- Renders graphics off-screen, sent to clients through **websocket**
- Javascript client receives data and draws on a **HTML5 canvas**
- Data interface to have native **Javascript** widgets



Architecture of the VNC-like solution      Screenshot of the VNC-like solution

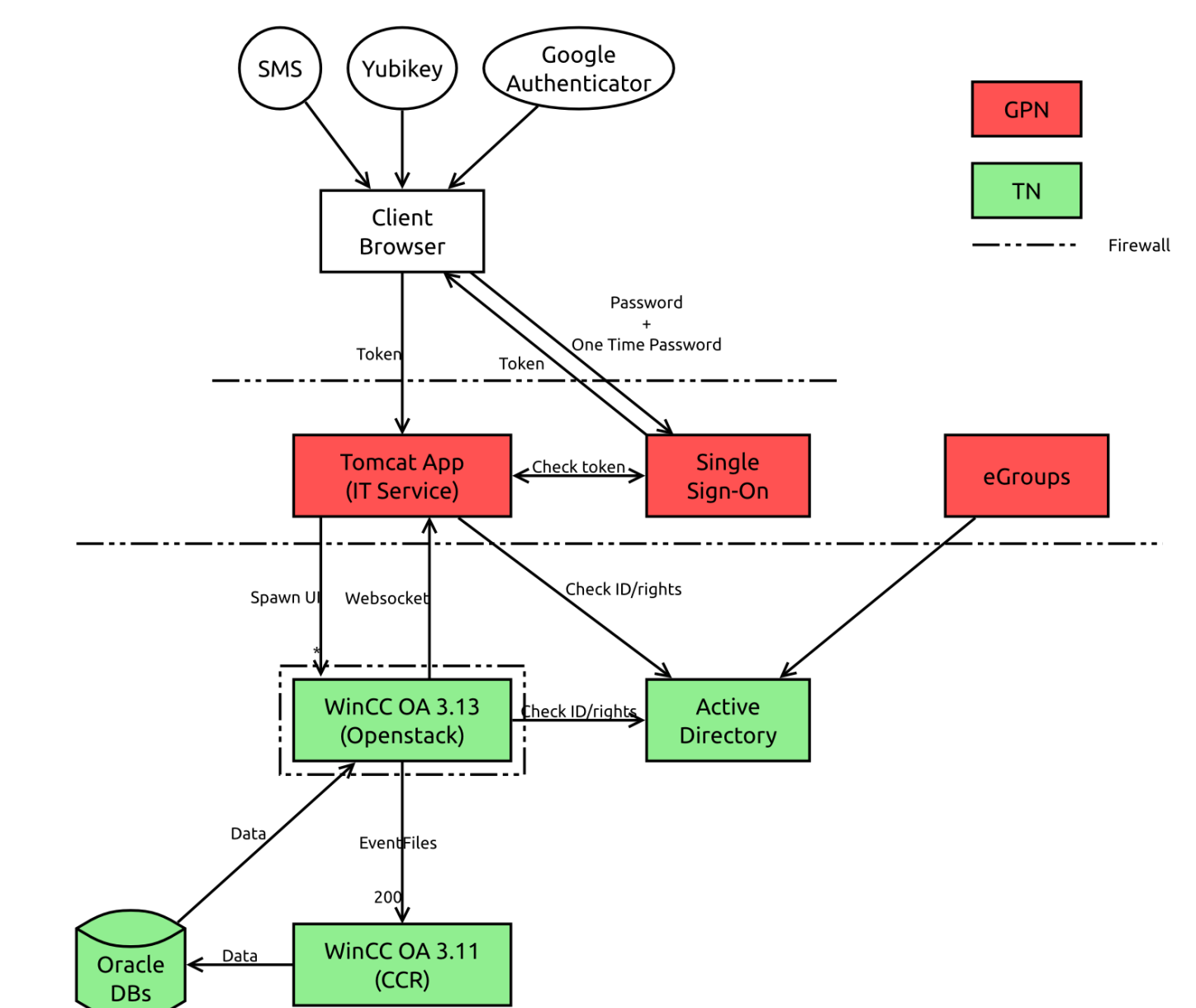
## Implementation

### Implementation

- Front-facing application server
- Farm of rendering virtual machines
- Production machines remain isolated for Internet traffic

### Security

- Web Single sign-on
- Multi-Factor Authentication
- Network segmentation with firewalls



Implementation in CERN context

Enabling web access to industrial control system is a feature expected by many CERN control system users. For these critical pieces of the installations it is important to ensure a robust implementation. Considerations about security, legacy developments, scalability and integration are fundamental in this project.

Through various prototypes and benchmarking a suitable solution using a VNC-like approach was found respecting all requirements. Users of industrial control systems at CERN will soon be able to access their supervision applications through a web browser without using dedicated software. This is the result of a fruitful cooperation between the provider of WinCC OA (ETM), the CMS experiment and CERN industrial controls team (EN-ICE).