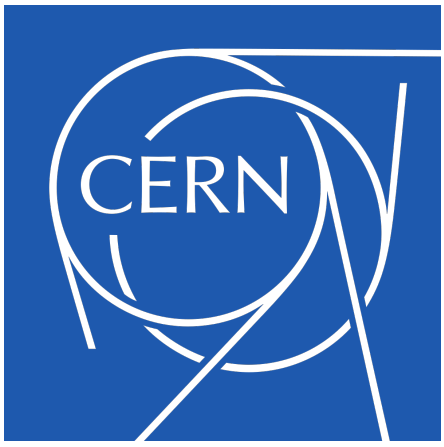


European Organization for Nuclear Research

University of Tunis El Manar

PROJECT REPORT

Development of LS3 Technical Person Power Monitor Tool

A Web-Based Solution for CMS Manpower Planning and Institute Contribution Tracking

Student:
Foued Trabelsi

Academic Program:
Engineering Degree
Computer Science Engineering

Academic Institution:
University of Tunis El Manar
Faculty of sciences of Tunis
Tunis, Tunisia

Host Organization:
CERN
European Organization for
Nuclear Research
Geneva, Switzerland

CERN Supervisors:
Michele Bianco
CMS
Hussein Chameseddine
CMS

Internship Period:
From 16 June 2025 to 08 August 2025

Report submitted on: 07 August 2025

Acknowledgments

I express my sincere gratitude to my CERN supervisors Michele Bianco and Hussein Chameseddine for their technical guidance and expertise in CMS operations. I thank the CMS Technical Coordination Office, Resource Management team, and LS3 scheduling team for their valuable feedback during development.

1 LS3 Technical Person Power Monitor Tool

1.1 What is the Tool?

The LS3 Technical Person Power Monitor Tool is a web-based application designed to monitor and manage manpower needs for CMS Long Shutdown 3 (LS3) activities. It serves as a centralized platform to track technical resources and coordinate contributions from CMS institutes worldwide.

1.2 Purpose and Goals

Primary Purpose:

- Anticipate demand for technical manpower during LS3
- Facilitate timely calls for resources from Projects and CMS Institutes
- Provide real-time visibility into resource allocation and gaps
- Streamline coordination between central activities and institute contributions

Key Benefits:

- Eliminates manual spreadsheet tracking
- Reduces coordination overhead through automation
- Provides data-driven insights for resource planning
- Improves communication between stakeholders

1.3 Restricted Access and Users

The tool is accessible from CMSonline web pages with restricted access to authorized personnel only:

Current Authorized Users:

- **CMS Technical Coordination Office (TCO)** - Strategic oversight
- **CMS Resource Management (RM)** - Resource allocation decisions
- **LS3 Scheduling Team** - Detailed activity planning
- **Coordinator of P5 Activities** - On-site operations management

Development Team: The tool is being developed collaboratively by CMS Interns and Summer Students, working closely with experienced CMS technical staff to ensure it meets operational requirements.

1.4 Main Functionalities

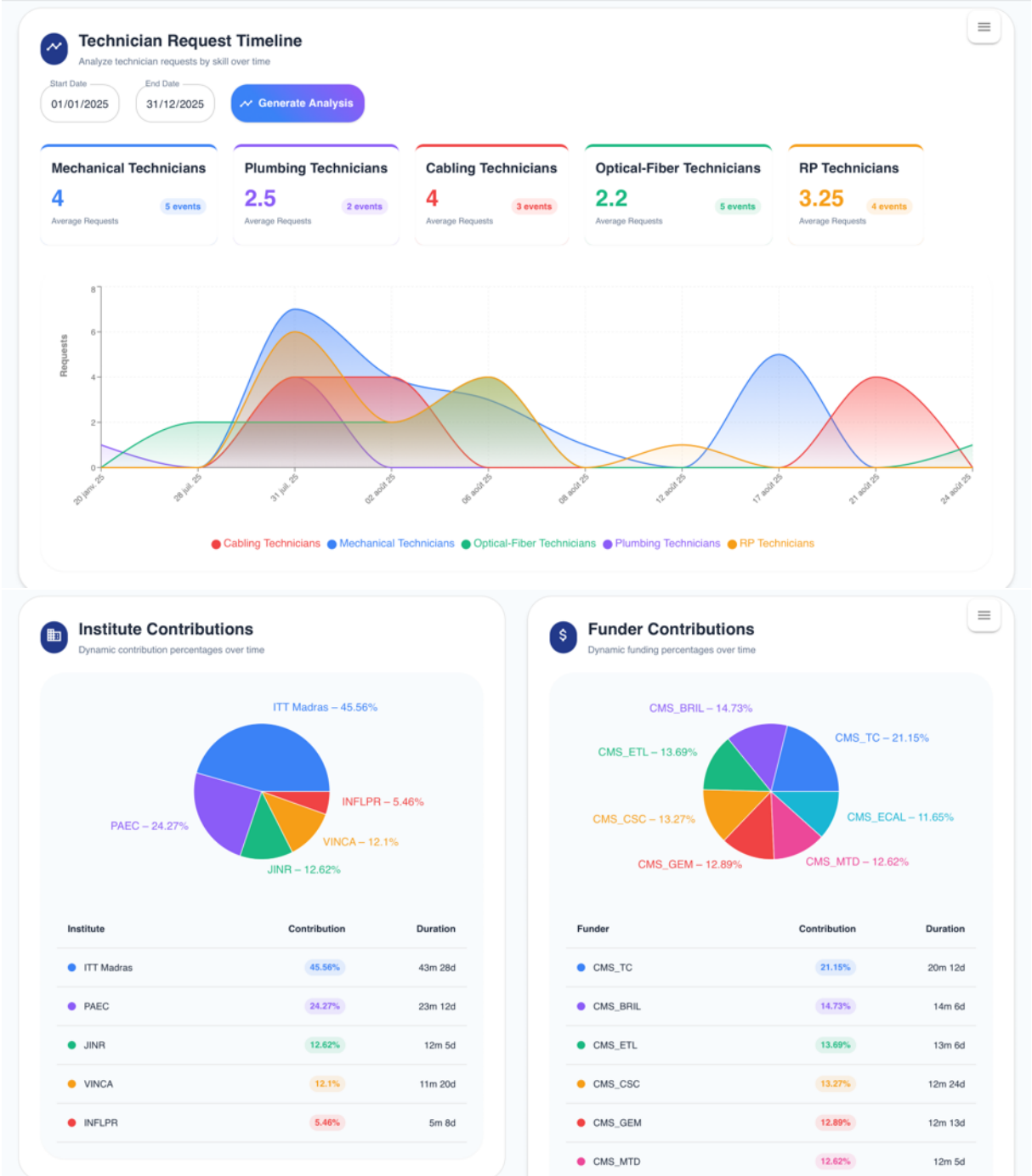
Core Features:

- **Calendar Interface** - Visual overview of scheduled technical activities
- **Resource Tracking** - Monitor technician allocations and availability
- **Gap Analysis** - Identify mismatches between demand and supply
- **Institute Contributions** - Track commitments from member organizations
- **Visual Analytics** - Clear indicators and summary statistics for decision-making

2 User Interface Overview

2.1 Main Dashboard

The dashboard provides an executive overview of all LS3 activities and resource status. Users can quickly assess the current state of manpower allocation and identify areas requiring attention.



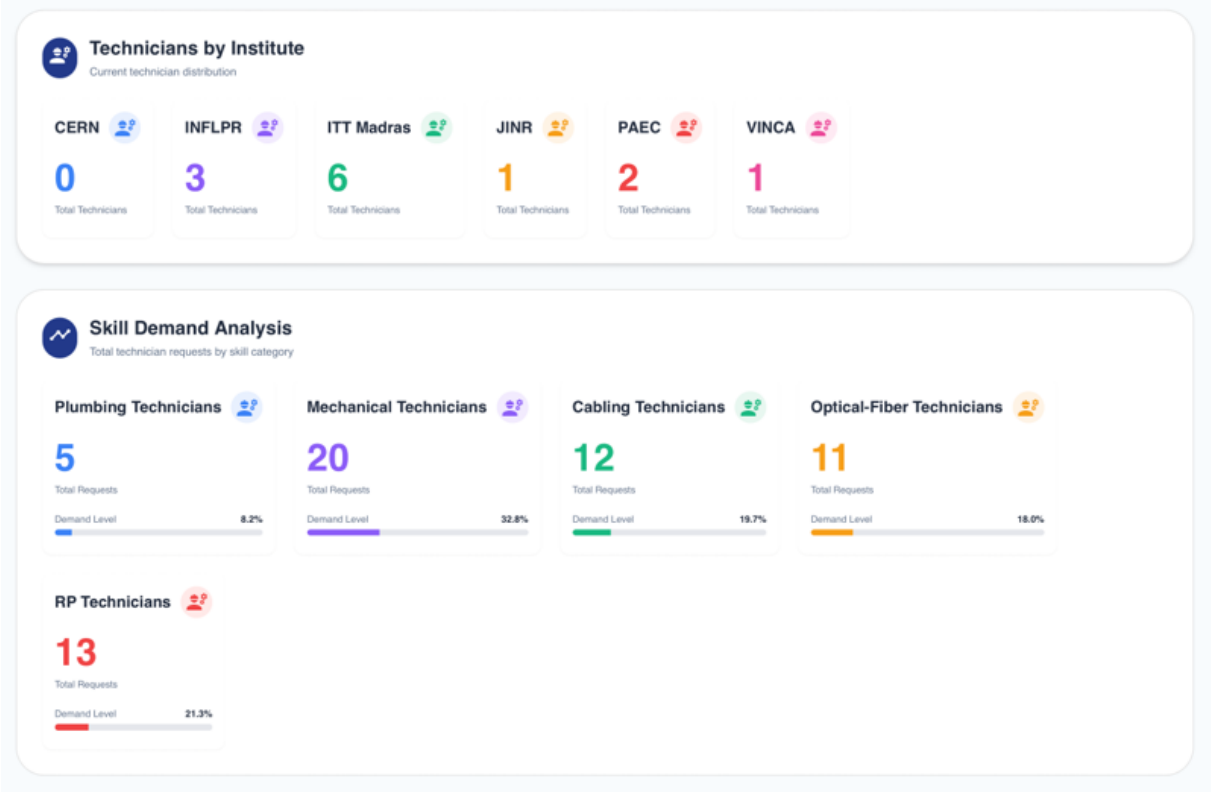


Figure 1: Main Dashboard showing activity overview and key metrics

Dashboard Features: This tool provides the ability to develop and display statistics of anything that might be found useful. Currently, we have the following:

- Technician requests timeline, showing average requests, peak requests, and the variation over time for each skill.
- Contributions from each institute in terms of duration of technicians provided.
- Contributions from each funder (CMS subdetectors) in terms of duration of technicians paid for.
- Total technicians provided per institute
- Demand analysis of each technician category/skill.

2.2 Calendar Management Interface

The interactive calendar allows users to visualize scheduled activities across different time periods and manage resource assignments through an intuitive drag-and-drop interface.

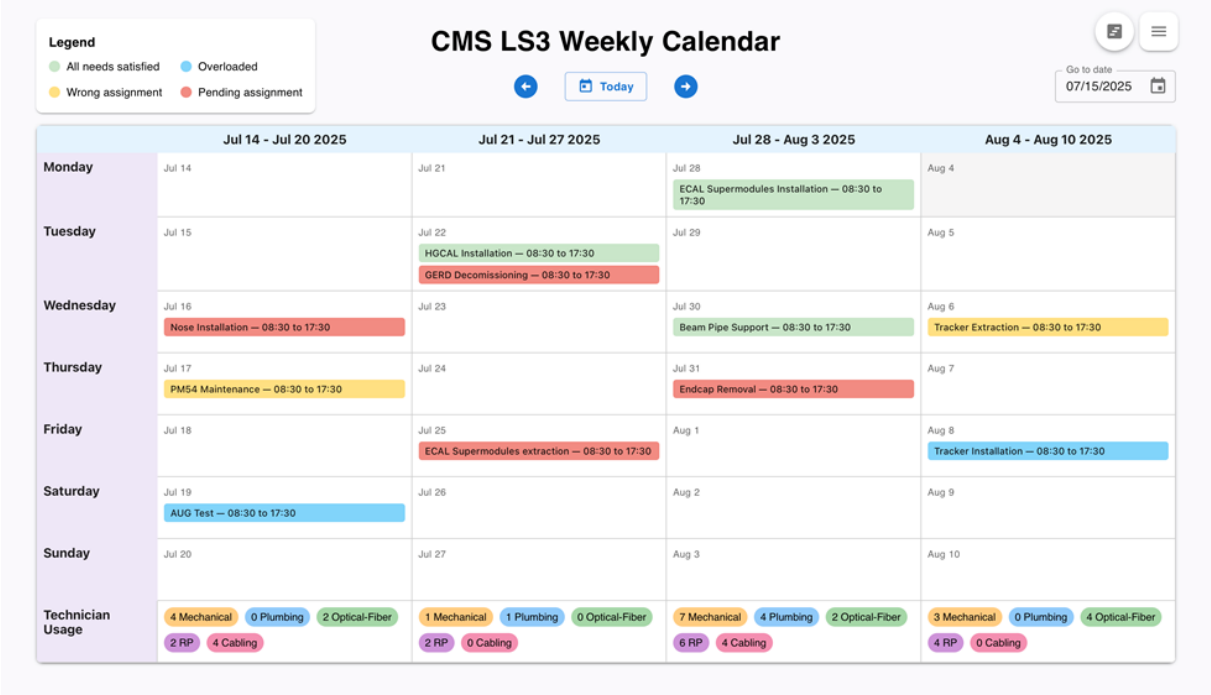


Figure 2: Calendar interface with scheduled LS3 activities

Calendar Features:

- Multiple view modes (month, week, day)
- Color-coded status indicators to imply if requested resources have been assigned:
  - Red – Pending assignment
  - Yellow – Incorrect Assignment
  - Blue – Over-assigned resources
  - Green – All needs satisfied
- At the bottom of each week, a Weekly Technician Usage Summary:
  - Indicates the number of technicians needed per skill
  - An algorithm that summarizes these needs to forecast our weekly technician usage.
- Filtering by activity type, location, or resource requirements
- Integration with personnel availability data

2.3 Table View

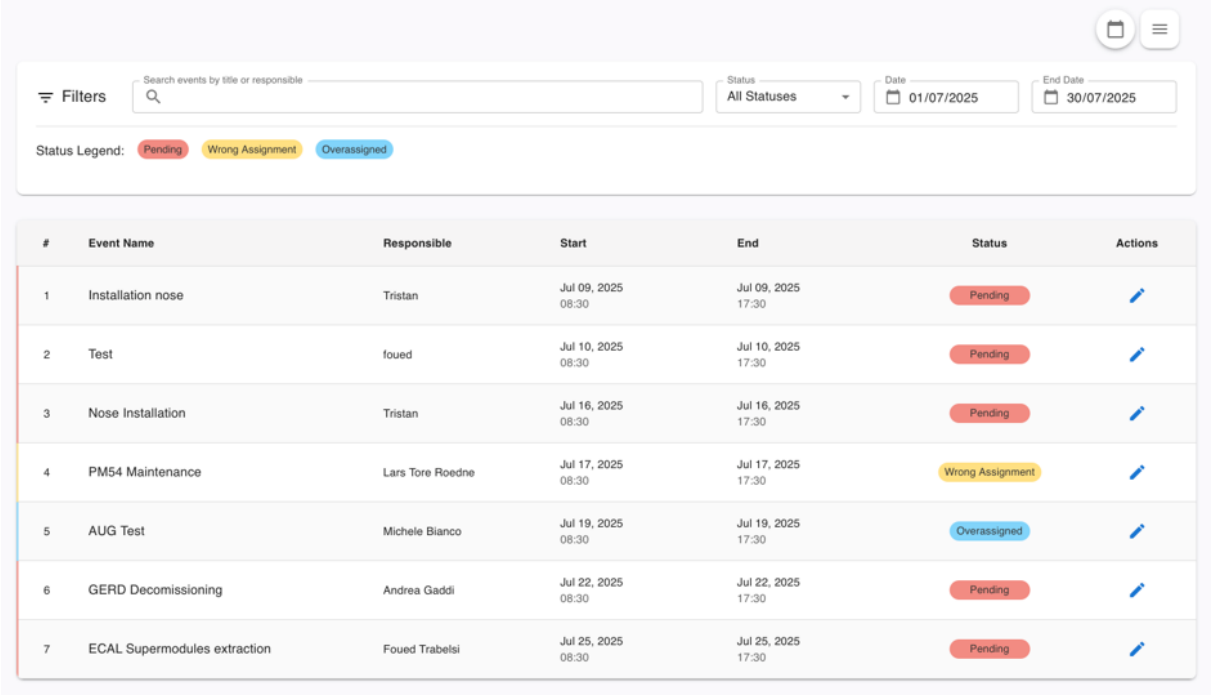


Figure 3:Table View

Table view Features:

- **Displays events with incomplete/wrong technician assignments**
- **Designed to highlight which events still require actions**
- **Offering filters:**
  - **By status (e.g., pending, overloaded, and wrong assignment)**
  - **By date range**
  - **By keywords, event responsible, & event names via the search bar**

2.4 Technicians Page

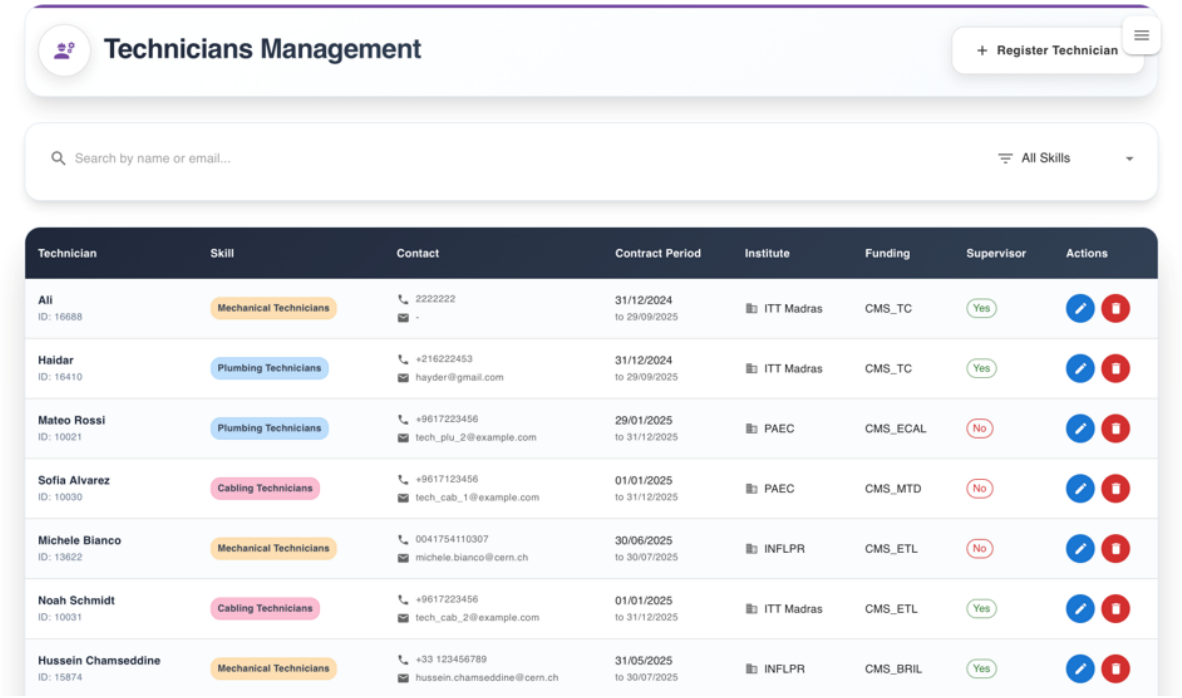


Figure 4: Technicians Page

Technicians Page Features:

- All technicians displayed with their respective details
- Ability to edit information, delete technicians, or filter based on words or skills
- Ability to register new technicians with ease

2.5 Institutes Page

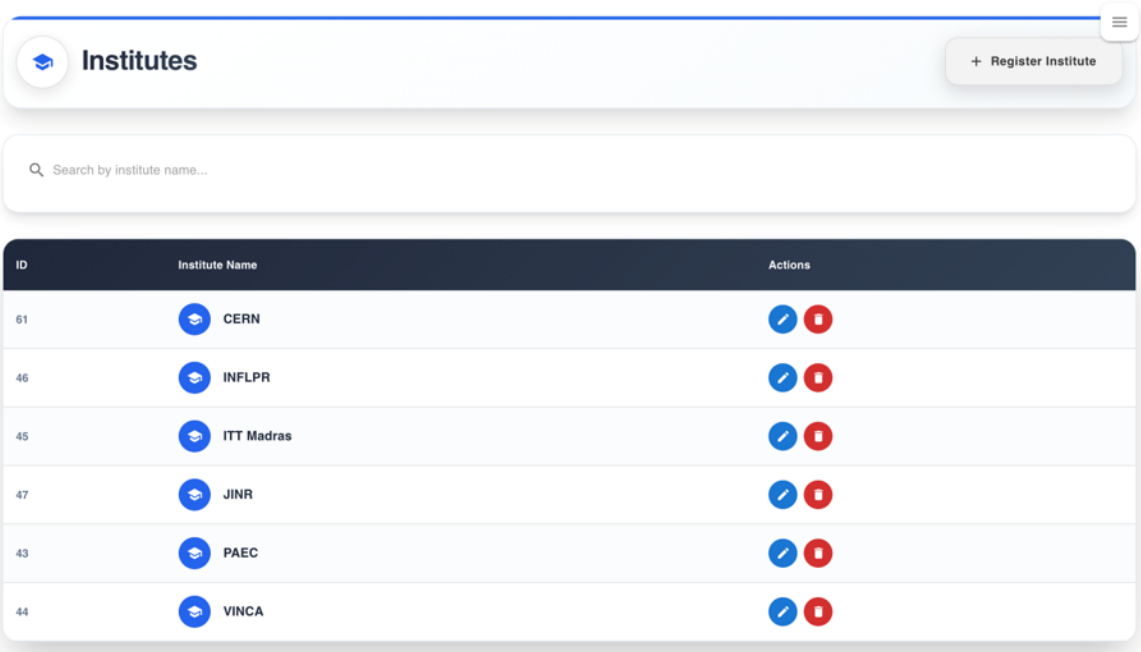


Figure 4: Institutes Page

Institutes Page Features:

- **All institutes displayed with their respective details**
- **Ability to edit information, delete institutes, or filter based on words**
- **Ability to register new institutes with ease**

2.6 Event Details Captured:

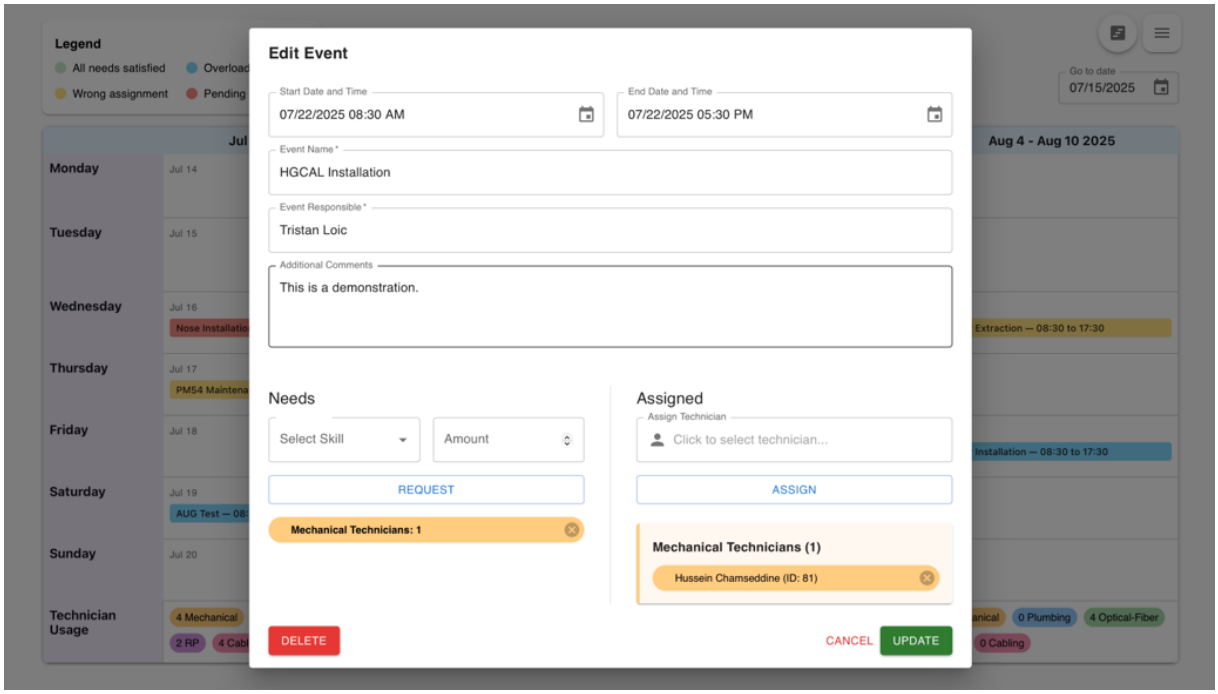


Figure 4: Event Page

Event Details Captured:

- **Event start date & time – end date & time**
- **Event Name**
- **Event Responsible**
- **Additional Comments**

2.7 Technician Planning:

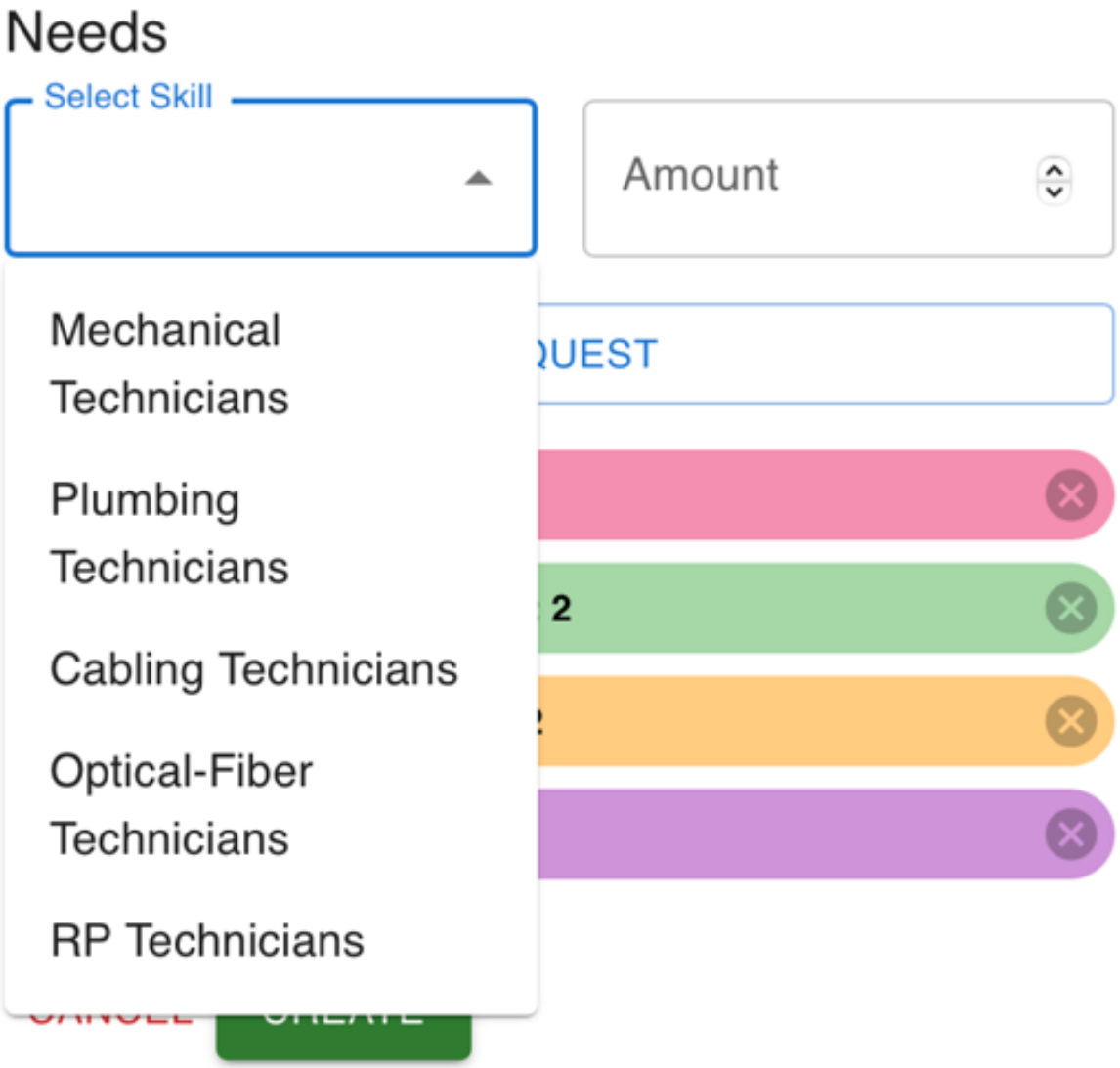


Figure 5: Technician Component

Technician Planning:

- **Specify the required technician skills (e.g., Mechanical, Cabling..)**
- **Define how many technicians are needed for each skill**
- **Each skill is defined by a color**

2.8 Technician Assignment:

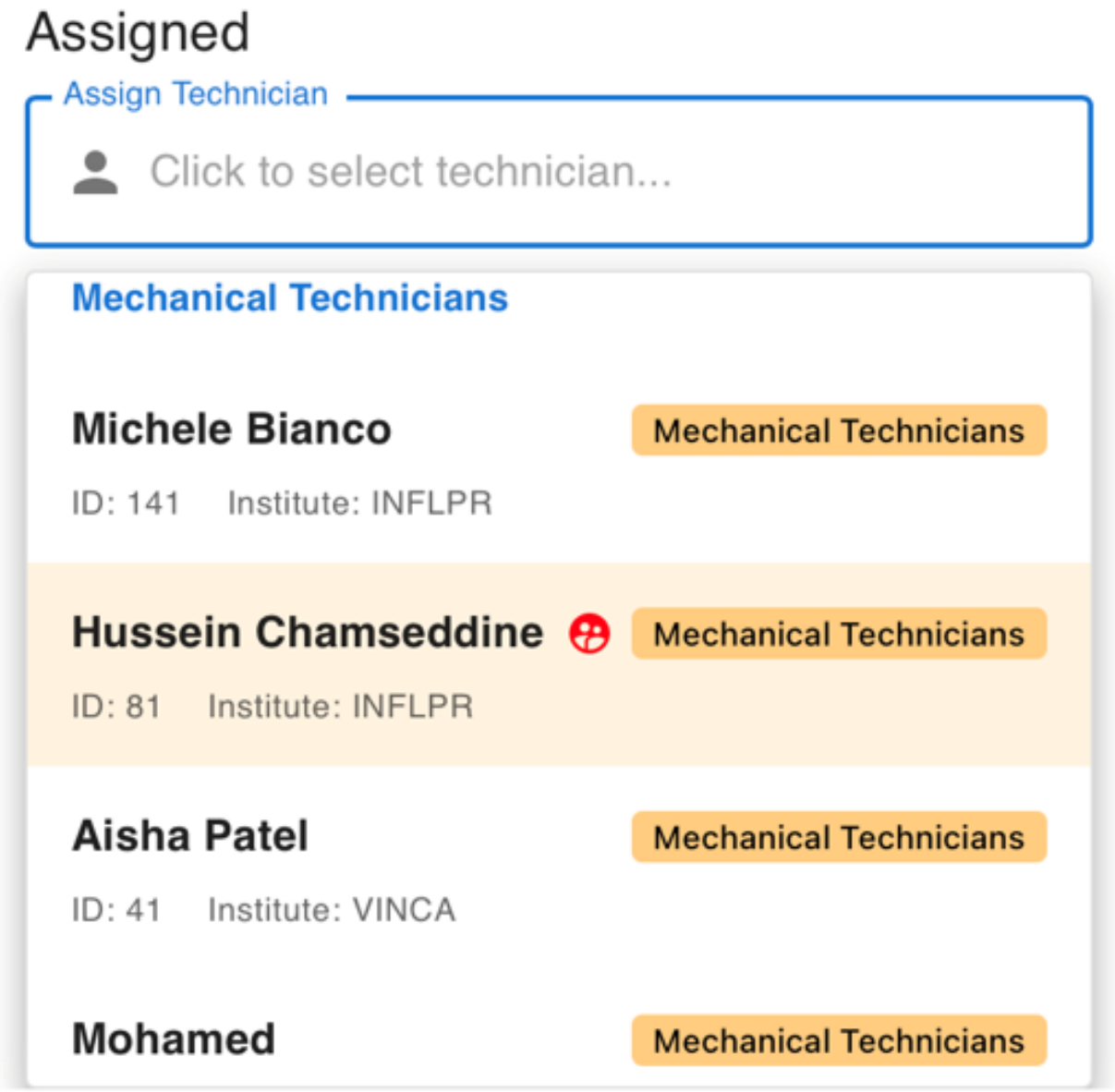


Figure 6: Technician Assignment Component

Technician Assignment:

- Select technicians from available pool, filtered by skill
- Match assignments according to the defined needs
- Technicians with time conflicts will not appear in the available pool
- Group supervisors are clearly marked with a red icon

3 Conclusion and Impact

3.1 Collaborative Development

This tool represents a collaborative effort between two students. Working closely with my teammate provided valuable experience in pair programming, joint problem-solving, and coordinating tasks in a small, focused development team.

Team Collaboration Highlights:

- **Joint development efforts covering both frontend and backend features**
- **Regular progress reviews and discussions to refine functionality**
- **Iterative development approach to implement and test features efficiently**
- **Continuous exchange of technical knowledge and coding practices**

3.2 Technical Learning and Growth

Developing this tool provided hands-on experience in enterprise-level web application development within a collaborative environment. The work involved integrating multiple technologies, improving development workflows, and applying best practices in modern software engineering.

Key Learning Outcomes:

- **Full-stack web development**
- **Database design and optimization for complex scientific data**
- **User experience design for specialized technical users**
- **Integration with existing CERN infrastructure and security protocols**

3.3 Future Impact

The LS3 Technical Person Power Monitor Tool will play a crucial role in ensuring the success of CMS detector upgrades and maintenance activities during Long Shutdown 3. By providing unprecedented visibility into resource planning and allocation, it will help optimize the utilization of technical expertise from institutes around the world.