ISBN: 978-3-95450-208-0 doi:10.18429/JACoW-IPAC2019-THPGW096

CERN ACCELERATOR OPERATIONS' PLANNING MANAGER AND DASHBOARD

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Abstract

Running CERN's complex of accelerators and infrastructure requires the seamless collaboration of many people, such as operators, experts and people-on-call to name only a few. Distributed in teams from different groups, it is important to centralise schedule planning and operational information and make this information readily available. In the operation's group these tasks are handled by two applications to manage shift work as well as on-call services and expert services. At the beginning of 2018, a project was started to replace the ageing application used to manage the on-call services. While collecting requirements we realised a more flexible application was needed to suit a broader set of customers, and to offer a more generic, people- oriented tool. The new planning tool consists of two separate applications: The "Planning Manager", which is used to organise work schedules of a team's members, and to keep each group's planning up-to-date, coherently, and visible to all involved. The "Planning Dashboard", which allows any user to create a customised view of the available services they use.

INTRODUCTION

The European Center for Nuclear Research (CERN) is a research facility located in Geneva, Switzerland. Most known for housing the world's largest and most powerful particle accelerator, the Large Hadron Collider (LHC), CERN runs a complex infrastructure of accelerators and services and employs several thousand people. At the heart of the laboratory is the CERN Control Center (CCC) where operators work 24/7 to monitor and coordinate all the activities and services that are needed to run the different facilities. Operators working in the CCC need to be able to quickly identify and reach the person on duty for a specific system (power supply, software application etc.) that might need a timely intervention to prevent an interruption of the physics program.

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PLANNING APPLICATION

People in charge of different services need primarily to organize teams and assign them roles, i.e. the period of time where they are responsible for a certain task. This could be a week of supervision as well as a daily task like an eight hour shift in one of the control rooms.

Systems

The application is built as a hierarchical structure of nodes (from here on referred as *Systems*) that serve to logically organize services as well as to separate responsibilities. Each system has administrators that are in charge of organizing people into teams and schedule their tasks. At any level an administrator can create sub systems and delegate responsibilities to other people.

In cases where a planning is required, it can be easily filled from the web graphical interface by selecting the role from a drop down menu and filling in the time slots in the calendar (macros are provided for repetitive pattern, like the ones used in the example in Fig 1: morning-afternoon-night) or by importing data from a comma separated file. Events

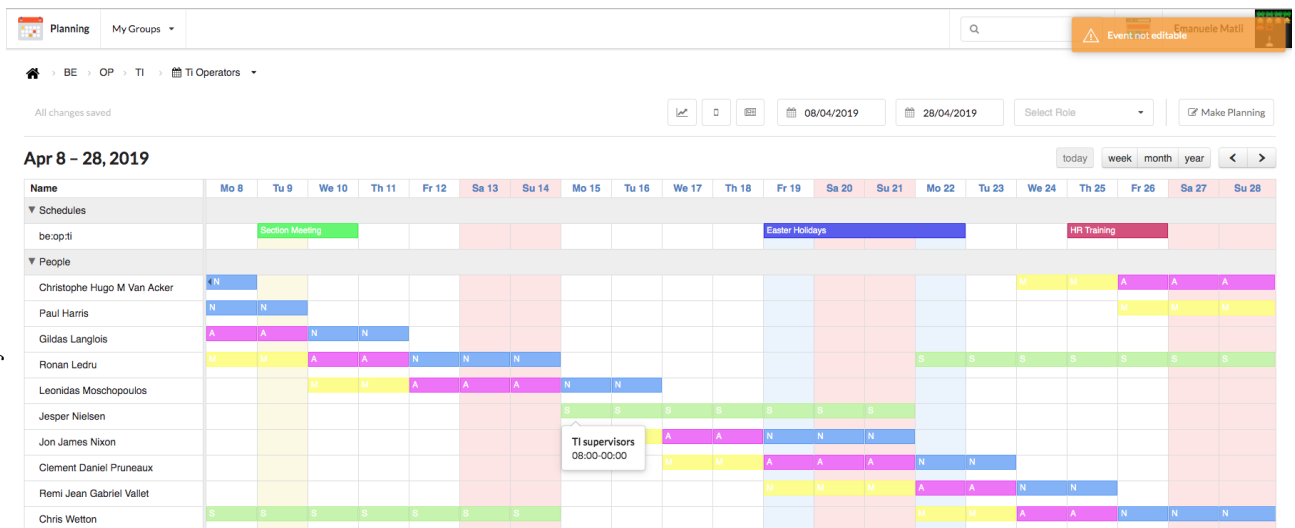

Figure 1: Admistrator view of planning calendar. Roles from different Groups are not editable in the current calendar.

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relevant to the group's activities can be added to the calendar as a schedule and displayed along the roles to better plan activities.

Some systems don't require a person to be on duty at all times, but still maintain a list of people that can be contacted, or they might maintain a planning for internal use only, without exposing this information to the general public. For these users cases it's possible to sort people by priority or, inversely, randomize the list to prevent always the people on top to be called.

Groups

Each system can contains several *Groups*. Groups are logical units that organize people and their *Roles*. In the example of Fig.1 we can see an administrator view of a system containing two groups: Operators and Supervisors.

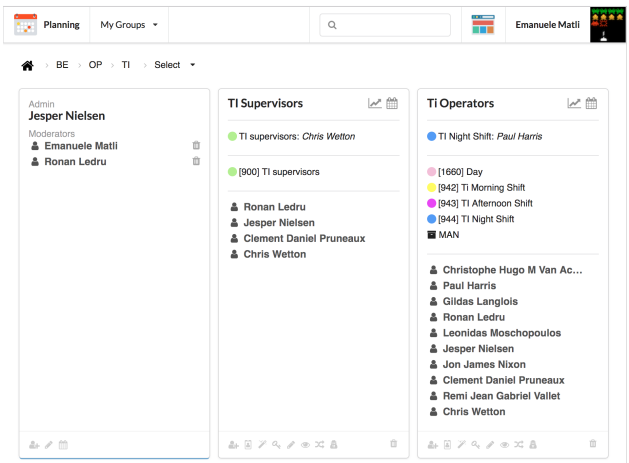


Figure 2: Adminstrator view of a System.

Each group has a set of roles that can be assigned to the members of the group to build a calendar (Fig.2).

Statistics are computed over a selectable time period to insure the work load is equally distributed across the members of a group (Fig.3).

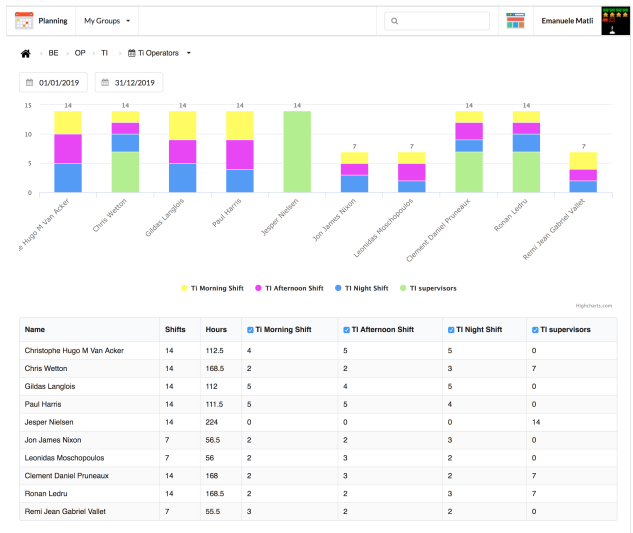
Roles

Roles can be added and edited from the web interface (Fig.4).

A pre-defined set of role types is available with pre-sets for default work duration, overtime etc. Administrators can decide if members of the group are allowed to edit the calendar on a per-role basis. A notification system is put in place to alert users when a calendar event is modified by a colleague.

PLANNING DASHBOARD

Described above is the interface used by administrators and members of the groups. For privacy reasons only members of a specific group have access to the detailed planning, but a large part of users is not part of any of these groups and just needs access to the information of the person on duty at



Name	Shifts	Hours	TI Morning Shift	TI Afternoon Shift	TI Night Shift	TI supervisors
Christophe Hugo M Van Acker	14	112.5	4	5	5	0
Chris Wetton	14	168.5	2	2	3	7
Gildas Langlois	14	112	5	4	5	0
Paul Harris	14	111.5	5	5	4	0
Jesper Nielsen	14	224	0	0	0	14
Jon James Nixon	7	56.5	2	2	3	0
Leonidas Moschopoulos	7	56	2	3	2	0
Clement Daniel Pruneaux	14	168	2	3	2	7
Ronan Ledru	14	168.5	2	2	3	7
Remi Jean Gabriel Vallet	7	55.5	3	2	2	0

Figure 3: Group statistics.

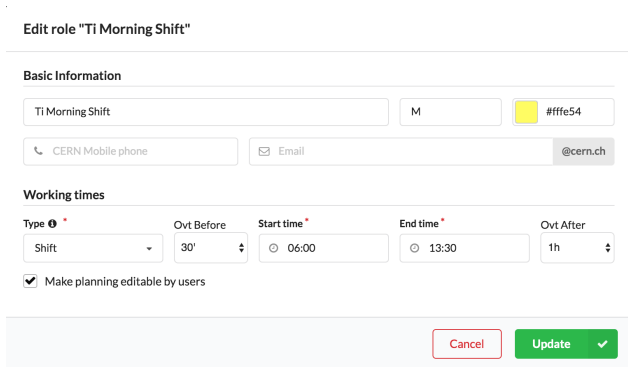


Figure 4: Role editor.

a specific time. A second interface has been developed to give them access to the planning data.

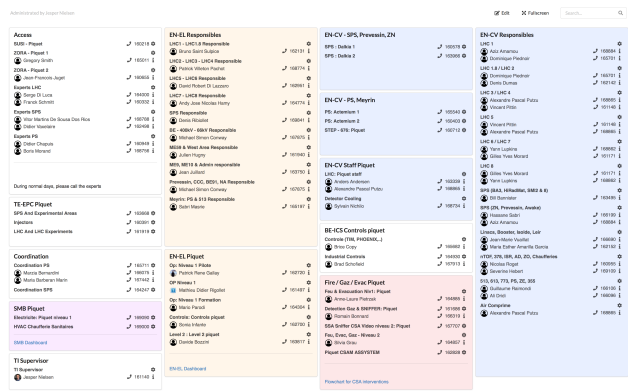


Figure 5: Example of dashboard.

The "Planning Dashboard" allows any user to create a customized view of the available services they use. Lists are maintained by persons responsible for each system, so all personnel can quickly know at any time who is on duty or who is currently responsible for a specific service. As the services that each user or team uses differ greatly, we

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made it possible for everyone to create a personalised dashboard with the information they most need. Each dashboard is composed of boxes that can contain text, links to other boards and (most importantly) roles that will be updated with information from the planning tool. For roles that are scheduled, the person on duty will appear on the list. For other roles, the list of experts will be displayed instead. An example is shown in Fig.5.

USER PREFERENCES

Each user has the possibility to share some personal information, like periods of absence, picture or to provide additional information such as a private phone number. Events from the planning can be exported in subscription calendar that can be integrated on mobile phones or desktop applications and notifications can be configured to alert a user by email or SMS before the start of an event.

TECHNICAL IMPLEMENTATION

The Planning and Dashboard applications are hosted on the OP-Webtools web portal [1] that was created more than ten years ago with the goal of giving a single access point to services used in the daily operation of CERN's accelerators. Since then it grew in scope and number of applications providing a solid framework for a rapid development of web applications.

The technologies have been evolving following the rapid changes in the web applications of the recent years. Hosting, data storage and authentication are provided by CERN's IT infrastructure and allow for an easy integration with other services. Data are persisted in a database and exposed through a REST API written in PHP to allow programmatic access to the data. Swagger [2] is used for documentation and the frontend application is developed using the VueJS [3] framework.

CONCLUSIONS

The planning application has been in service since 2018 and counts now more than 800 users and 110 systems. It has been widely adopted across the organization and has been integrated with existing systems used to manage absences and payrolls, and is being considered both by other research centers and by commercial partners for licensing.

REFERENCES

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