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INCEPTION OF A LEARNING ORGANIZATION TO IMPROVE SOLEIL'S OPERATION

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Abstract

High quality of service is a key mission of SOLEIL since 2007. Historically operation processes and information systems have been defined mostly on the fly by the different teams all along the Synchrotron's journey. Some major outcomes are a limited cross-teams collaboration and a slow learning organization. Consequently, we are currently implementing a holistic approach with common operational processes upon a shared information system.

Our first process is "incident management"; an incident is an unplanned disruption or degradation of service. We have tackled incident management for IT in 2015, then for the accelerators since January 2018. We are starting to extend it to beamlines since beginning 2019. As a follow-up, we will address the "problem management" process (*a problem is the cause of one or more incidents*) and the creation of a knowledge database for the operation.

By implementing those processes, the culture of continuous improvement is slowly spreading, in particular by driving blameless incident and problem analysis.

This paper will present the journey we have been through including our results, improvements and difficulties of implementing this new way of thinking.

SOLEIL OPERATION CONTEXT

The operation reliability is strategic for SOLEIL as it delivers around 6500 hours of beam time per year included 5019 hours for users [1]. SOLEIL permanent staff is composed of 350 people with:

- 70 dedicated to Accelerators operation
- 180 dedicated to 29 Beamlines.
- 70 for transversal services for facility management, ultra-high vacuum, electronics, computing…

Historically, no global governance for operations had been set up, in particular regarding incident management or preventive maintenance plans. All methods and tools have been defined "on-the-fly" by technical teams with overlaps:

- Some teams that manages hardware use a CMMS (Computerized Maintenance Management System), Maintimedia [2]
- Others use Jira [3] mainly as a software bug tracking.
- The operational teams (Accelerators operators and Experiment Hall coordinators) also use a tool called ELOG [4] to track some incidents.

The major drawbacks of such an organisation were:

- A limited cross-team collaboration as the information was logged in each team specific tool
- Incident response was focused on the technical topics instead of the service restoration, underestimating the impact on the operation of SOLEIL
- Difficulties to improve the global services, due to repetitive incidents

Our team (Controls) is daily involved in the operations of the Accelerators and the Beamlines. By considering all previously quoted issues, we have decided to define and drive the implementation of new operation processes, first for our team, and then for the whole organisation. The long terms objectives of such an approach are:

- Reinforces cross-team and collaboration, e.g. between Accelerators, Beamlines, and technical teams.
- Share the operation knowledge and add efficiency
- Provide a living, up-to-date and easy-to-use information system to support these processes.

ROLLOUT OPERATION PROCESSES FOR IT

In 2015 SOLEIL IT division decided to adopt ITIL [5] to enhance all IT services (*from office IT, Controls, IT Infrastructure*) as detail in the following paper [6]. ITIL was first used in the Controls group and after a few months helped gradually to improve the service delivered to Accelerators and Beamlines teams. "Incident Management" was considered as the first transversal process to enhance but some I.T teams were already implementing other processes such as "Problem Management", "Change Management", etc.

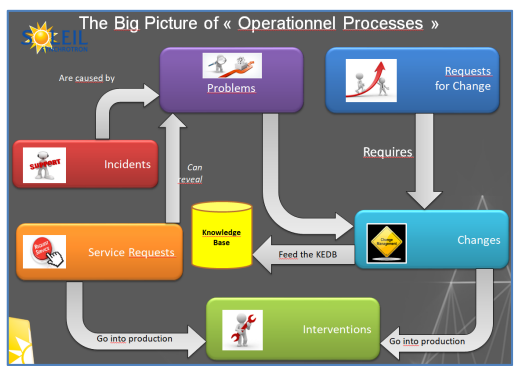

Figure 1: ITIL Operational Processes.

On the technical side, all the processes have been implemented with Jira [3] since 2015 (see Fig. 1). Jira has been linked to the SOLEIL CMMS tool, Maintimedia [2] in 2017:

- Jira is the main user portal and the defects are cascaded to Maintimedia.
- the progression of Maintimedia issues can be directly checked into Jira;

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In 2018, our processes were extended with a knowledge database (Confluence [7]), which keeps track of troubleshooting procedures that are easily accessible through Jira.

This new way of working improved our efficiency, but to fully optimize the whole process, implying more operation stakeholders was mandatory. For that reason, we have extended it to Accelerators and Beamlines and received a strong support of our management.

ROLLOUT OPERATION PROCESSES FOR ACCELERATORS

The transition successfully done by and for the Computing teams, gave the opportunity to roll out to Accelerators early 2017. Indeed to reach high performance Accelerators operation, the Operation group had established some quality measurement to have an accurate and detailed follow-up of the operation with well-defined metrics and tracking of the majority of the incidents.

Implementing the Change

A transversal team between Accelerators & IT teams has been set-up to exchange through workshops about current accelerators operation practices, their drawbacks, and a comparison with what had been done for IT teams. Then a common way of working has been approved; the Accelerators will:

- Implement and share all the same processes than those implemented for IT,
- Mainly focus on implementing the incident process with Jira [3].
- Each Machine incident will bookmark an ELOG [4] entry that details all the operations actions and the follow-up of an 8 hour shift.

After some acceptance tests, a new incident management system went live in January 2018 for the Accelerators operation. As detailed in Fig. 2, it is implemented with Jira. When an incident implies hardware, it creates an issue in our CMMS. Each incident also bookmarks a logbook entry in Elog.

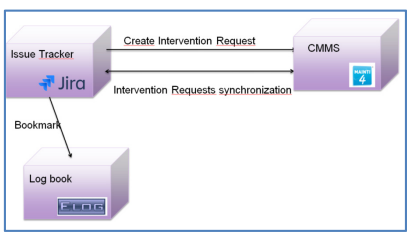

Figure 2: The integration architecture.

The JIRA tool was quickly adopted and managed by the Accelerators operators. The operators' team have gone beyond strict usage as they developed their own software tools to simplify their daily routine:

- A web interface upon JIRA to simplify incident entry,
- A web reporting tool to get beam and incidents statistics: the tool was extended to be connected with the JIRA incident database.
- Some automatic incident detections and remediation with automatic Jira issue creation on specific event or incidents.

Even all operation regular meetings have been adapted to base all the follow-up upon reporting provided automatically by JIRA.

Just a few months after, extending its usage to problem management became vital as many repetitive incidents were no handled properly. An incident "post-mortem" process has been set up inspired by the SRE book from Google [8], in order to review resolved incidents without jumping immediately to conclusions. A careful analysis must be performed on all resolved incidents to identify improvements opportunities. If the incident root cause is unknown, a new "problem" issue is created into Jira. A problem is treated with two different angles:

- Workaround: Search and document a workaround, to decrease the impact of future similar incidents.
- Definitive resolution: "Root cause" analysis, and, if possible, trigger changes that will avoid next incident occurrences.

The status of the Accelerators projects, the products evolutions and their priorities has been also included into Jira, and are smoothly tracked with Kanban dashboards.

The operation team have adopted quickly the processes and Jira tools but there were still 140 persons to train to correctly handle these new processes and Jira. A dedicated workgroup became necessary to ensure the roll-out in each team and a SPOC (Single Point of Contact) has been designated. With this group of 20 SPOC persons, representing all technical teams it then became possible to meet altogether, share our experiences, and train them.

Key Results

The incident management process has introduced a clear separation of responsibilities:

- The operators are now accountable for all incidents that may potentially impact the Accelerators operation.
- Managing each incident is now focused on minimizing the impact rather than doing technical troubleshooting
- There is a clear distinction between incident resolution and post-mortem analysis activities.
- Technical teams have the entire ownership of an end-to-end service (i.e. power supply team is now the accountable for the controls power supply software reliability).
- A new role of incident manager has been defined to monitor daily operations and drive incident post-mortem analysis (Fig. 3).

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Figure 3: Overview of last week incidents for the Accelerators incident manager.

Consequently, the accelerators operation coordinators have noticed many improvements, the traceability has increased, and seamless communication is the new norm (see Operators' posters at WAO workshop in 2018 [9] and [10]). All technical teams are now more engaged around the operation and incident resolution time has decreased drastically. It has also ease up the coordination and communication with Beamlines for Accelerators incidents that may impact the beam delivery, its quality or its stability.

Thanks to its flexibility, JIRA has proved to be a well-adapted tool to support the operation traceability, communication, and follow-up. It has been configured for each role and activities. For instance, each technical team has inherited a dedicated JIRA dashboard (as shown in Figure 4) and automated email notifications, so that they are continuously aware of:

- The incidents on their services that they must resolve (Fig. 4: red panel)
- The incidents assigned to others teams but which impact their services *(e.g. a water cooling issue that may affects a power supply)* (Fig. 4: orange panel)
- All incidents resolved that must be reviewed by the technical team. (Fig. 4: green panel)
- All incidents resolved that must be reviewed by another technical team (Fig. 4: purple panel)

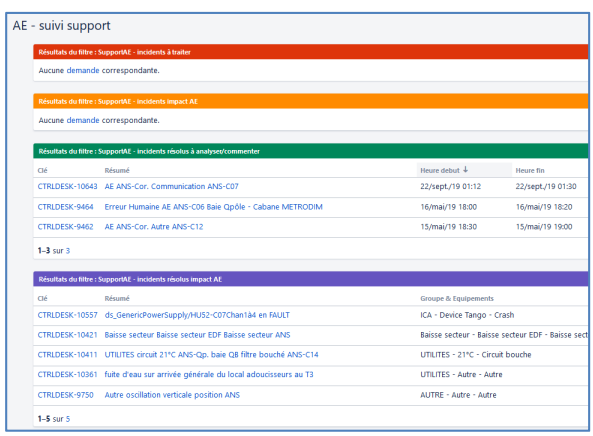

Figure 4: A Jira dashboard for the power-supplies team.

In Fig. 5 is the web interface developed by the operators to have at a glance online statistics on the Accelerators operation. Various indicators are represented like the beam delivery time, incident number per sub-system.

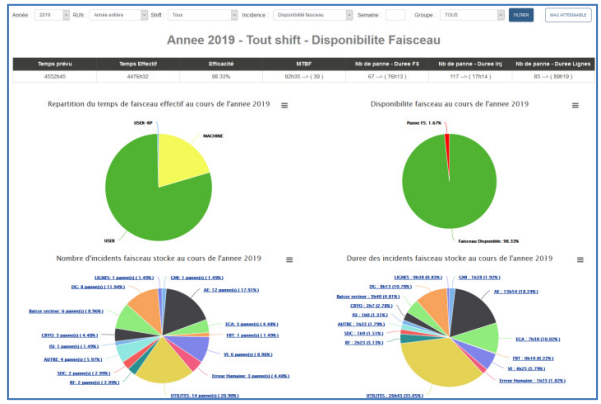

Figure 5: Beam availability and incidents statistics.

Next Steps

Many challenges have been tackled for incident management but improvements are still to be achieved in the following fields:

- "Knowledge sharing": Confluence [7] is now used locally by several teams without major difficulties but no transversal processes are yet defined to manage operational knowledge. We must finalize the rollout of Confluence for the Accelerators operation.
- "Problem management": it is today mainly used for incidents with high impact. A proper implementation requires long-term and time-consuming work, as it often has to address very complex issues with various technical and non-technical topics; the root cause might even point out an early design issue.
- "Product and Project management": day-to-day priorities are now clearly defined, but it has been identified that Agile [11] will be a key factor to improve our global efficacy.

ROLLOUT OPERATION PROCESSES FOR BEAMLINES

Motivations

In 2015, despite 10 years of operation, the operational interfaces and processes between technical groups and beamlines teams have never been really defined. As a consequence incident resolution could last too long which lead to tensions and misunderstandings between Experimental and Engineering division. On the other hand technical teams were overwhelmed by operational activities, leading to very few room for delivering new functionalities on the services they are in charge.

Implementing the Change

A working group headed by SOLEIL' director composed of scientists, beamline technicians, representatives of technical/engineering teams, floor coordinators, the communication team, and the quality manager has been created at the end of 2017. The main goal was to improve the beamlines operation. The open discussions have highlighted significant divergences as detailed hereafter:

Point of view of Beamlines and floor coordinators The too technical vocabulary employed by the engineer-

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ing teams was creating communication issues. The lack of tools coherence between engineering teams reinforced this feeling.

Actually, as beamlines teams are focused on providing scientific services to external users they were expected to have one simplified and intuitive tool to declare and follow the technical incidents until their resolution.

Point of view of engineering teams Some communication difficulties were also pointed out with usually a lack of incident qualification (*i.e. event history, screenshot, application logs…*), leading to a complex and costly resolution.

The missing traceability for incidents resolved directly by beamline staff concerning the services they manage, implies difficulties to improve the quality of service.

Furthermore, each team wants to keep their own traceability tool to avoid tracing in multiples tools.

In summary, the expectations for technical teams were:

- Responding only to incidents fully qualified by Level 1 support (beamline staff or floor coordinators)
- Facilitate hand-offs between all incident participants
- Better tracking to provide information that can allow efficient "post mortem" analysis.

Action plan Thanks to 14 meetings between October 2017 and November 2018, common goals have been finally agreed:

- Improve incident management; reducing resolution times and incident number
- Better definition of responsibilities
- Better dialogue in a shared vocabulary

To comply with these objectives, we have implemented the following action plan:

- Define a shared common incident workflow clarifying the roles of the various teams.
- All incidents will be tracked with Jira, by Beamlines staff, floor coordinators and technical teams.
- Install and configure a Jira extension, "Jira Service Desk" [12] that provides a simplified interface to declare and track incidents.
- Use Confluence [6] as knowledge base to provide Beamline and floor coordinators trouble-shooting instructions
- Create automatically issues in the CMMS [3] tool for the technical teams that uses it when the incident is assigned to their team.
- Setup a communication plan towards all teams involved in beamline operation with a series of seminars to explain the strategy to the whole SOLEIL staff

Key Results

After a period of test on one Beamline, the incident management has been deployed gradually and is in operation for 13 Beamlines since beginning of 2019 with Jira Service Desk and Confluence (see Fig. 6 and Fig.7). With a simpler incident tracking system, the traceability has improved a lot. Moreover, as the communication has been carefully prepared jointly by the director, the communication team, beamlines and technical staff, the reluctance to the processes and tools have finally decreased.

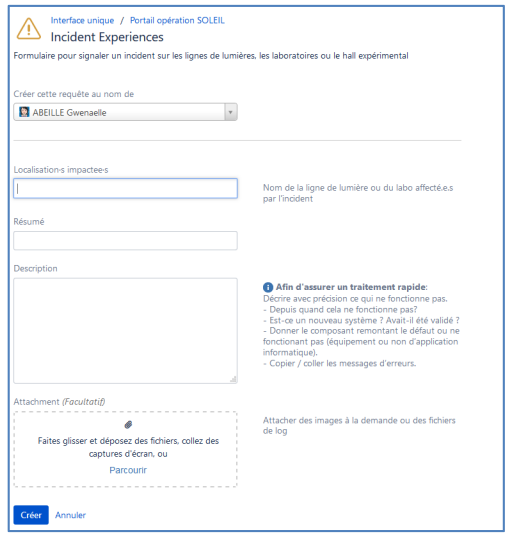

Figure 6: The Jira service desk interface with a simplified form to create incidents for beamlines.

An inception of a knowledge database with Confluence has been set-up and it is accessible directly from the incident creation form, see Fig. 6 and Fig. 7.

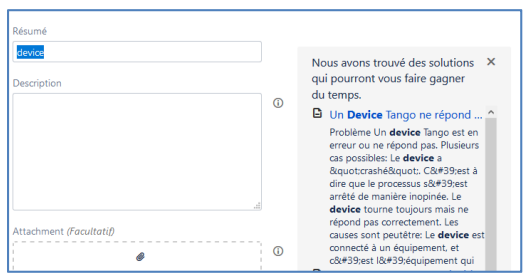

Figure 7: Jira service desk interface is connected to Confluence knowledge database for guiding the user with troubleshooting instructions.

Next Steps

That was the first step, but there still are many enhancements to do:

- Validate the current implementation and extend it to all 29 beamlines
- Still, many incidents are not tracked properly; as many are still opened, but probably already resolved
- Nothing has been defined for the incident post-mortem analysis step for beamlines.
- We should provide more local support and training to beamline staff to guide them to properly track incidents.

LESSONS LEARNED

This journey is certainly no easy ride but the result is worth the efforts. For the first time at SOLEIL, common operation processes and tools are now shared by the whole synchrotron facility.

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A major cultural shift is now in progress. Almost everybody shares the ownership of the operation reliability; the continuous improvement cycle is the new motto of many teams at SOLEIL now, as they try to provide the best quality of service as possible.

To introduce this new paradigm, we had some major factors to consider. The main key factor of success is "**People first**" and tools and processes in support, and not the other way around. To achieve a global acceptance, changing work methods have been implemented with a daily "on the field" support, with a good dose of "common sense" and continuously adapting the methods and the tools to the various stakeholders' feedbacks: listen to their concerns, explain the strategy, and train them. This represents a very demanding and time consuming effort but it is absolutely mandatory.

Another success factor is that our journey was a bottom-up initiative driven by a team that is deeply involved in everyday operation. Nevertheless, to extend this kind of change to the whole organization, the support of the top management is mandatory at some point. In our case this support has been real and efficient. But the needed resources for change management were and still are largely underestimated, as well as the importance of cultural aspects.

And finally but not least, there is no "magical" software that can fulfilled all the needs, the lasting strategy is to anticipate the information system architecture and integrate several interoperable solutions together.

FUTURE PLANS

In the near future, SOLEIL will continue to extend and improve the operation good practices along with its information system. Promoting a more experimental culture (the famous "Fail fast" maxim) with continuous adaption has been successful and we will continue down the same road.

In addition, the manual and error-prone tasks will be automated as far as possible. For instance, SOLEIL is lacking monitoring, alerting and remediation systems on several critical fields, like for instance for IT security or Control systems.

Even though Agile [12], DevOps [13] or Lean Production System [14] principles have not been literally applied, they have been the bedrock of our journey. These systems of values will grow in scope in the years to come to address the challenge of the SOLEIL digital transformation.

REFERENCES

[1] L. S. Nadolski *et al.*, "SOLEIL Status Report", in *Proc. IPAC'18*, Vancouver, Canada, Apr.-May 2018, pp. 4516-4519. doi:10.18429/JACoW-IPAC2018-THPMK092

[2] Maintimedia, https://www.tribofilm.fr/en/softwares/maintimedia-cmms/

[3] Jira, https://www.atlassian.com/software/jira/core

[4] Elog, https://elog.psi.ch/

[5] ITIL methodology: https://en.wikipedia.org/wiki/ITIL

[6] A. Buteau, G. Abeille, B. Gagey, and J. C. Fouquet, "Improving SOLEIL Computing Operation with a Service-Oriented Approach", in *Proc. ICALEPCS'15*, Melbourne, Australia, Oct. 2015, pp. 441-445. doi:10.18429/JACoW-ICALEPCS2015-MOPGF150

[7] Confluence, https://www.atlassian.com/software/confluence

[8] Postmortem Culture: Learning from Failure, https://landing.google.com/sre/sre-book/chapters/postmortem-culture/

[9] Reporting Incidents Using JIRA Software at Synchrotron SOLEIL, WAO'18: Workshop on Accelerator Operations, https://indico.bnl.gov/event/3878/contributions/23721/attachments/20126/26761/Reporting_Incidents_using_Jira_Software_at_Synchrotron_SOLEIL.pdf

[10] SOLEIL Beam Statistics and New Metrics, SOLEIL, WAO'18: Workshop on Accelerator Operations, http://indico.bnl.gov/event/3878/contributions/23720/attachments/20127/26762/SOLEIL_Beam_Statistics_and_New_Metrics.pdf

[11] Agile manifesto, https://agilemanifesto.org

[12] Jira service desk plugin, https://www.atlassian.com/software/jira/service-desk

[13] The tree ways of DevOps, https://itrevolution.com/the-three-ways-principles-underpinning-devops/

[14] Lean production system, https://en.wikipedia.org/wiki/Lean_manufacturing