Conceptual Design of the Operation Logbook System at KOMAC

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1. Introduction

KOMAC operates a 100MeV proton accelerator. Since its operating in 2013 year for beam service, it has been running at an average of 3000 hours per year.[1] Operation of the accelerator often leads to various issues, some of which may recur. When some similar problems occur, they can be quickly identified and resolved with well-documented information. Apart from issue resolution, systematic accelerator operation is facilitated by well-recorded experimental data and opeational logs. It has been maintained manually and in Word files that operational logs, machine emergency stop records, etc. However, manual records are prone to loss because of physical damage, fire, etc. Additionally, finding past records in handwritten files is also not convenient. Similarly, Word files have limitations and are stored locallly, so the sharing isn't intuitive. Moreover, the file-based logbook operates independently of the KOMAC control system, making direct access to relational information impossible. To solve these limitaions, the development of an operational logbook has been proposed. This logbook aims to record operational logs in a database, enabling easy access to past records.

In this paper, we introduce the functionalities to be implemented in the KOMAC operation logbook system, discusses the development approach, and ou tline the overall plans.

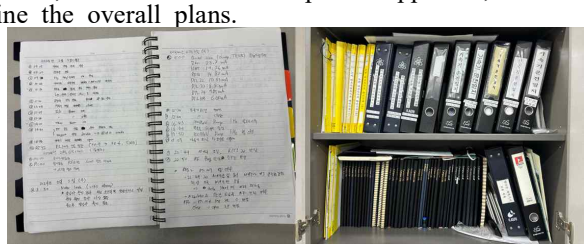

Fig. 1. Handwritten operational records

2. Required logbook system for KOMAC

We aim to develop a logbook customized to the KOMAC operating environment. Among the essential features required for developing the logbook are functions such as record creation, reading, updating, deletion, and search. But, only authorized personnel should be allowed to create, delete or modify entries, with all actions recorded to identify the responsible party. Accordingly, an account authentication system is necessary to provide access control. To establish differentiated permissions, users will be categorized into readers, operators, leaders, and administrators. Readers have read-only access and cannot create, update, or delete any logbook entries. Operations, as general users, have the rights to read, create, update, and delete entries, but modification and deletion are restricted to the entries they authored. Leaders have full access over creating, updating, and deleting entries, with access to all logs. Administrators have user management functions, including the privileges of leaders.

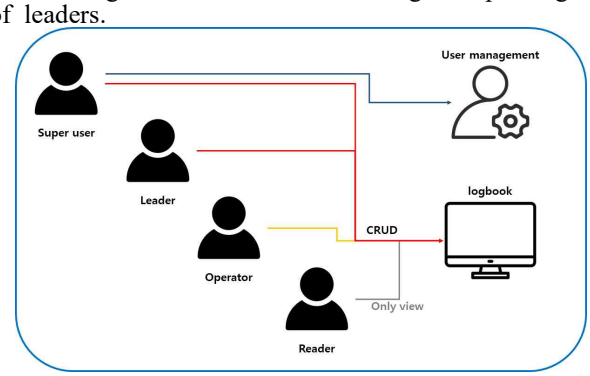

Fig. 2. User permissions according to the grade

The logbook contains various themes of records, including daily operational logs, equipment issues records, and beam tuning related records. The daily operational logbook is composed of entries encompassing equipment trip records and beam tuning logs. Each separately recorded log information can be loaded into the daily operational logbook, and it will be implemented to be automatically recorded in sequential order. Using a link-based approach, pages are inserted within the logbook for easy accessibility to each entry. As multiple operators participate in creating the daily operational log due to shift changes, anyone should be able to update it, and it should be possible to identify who added or modified entries and when.

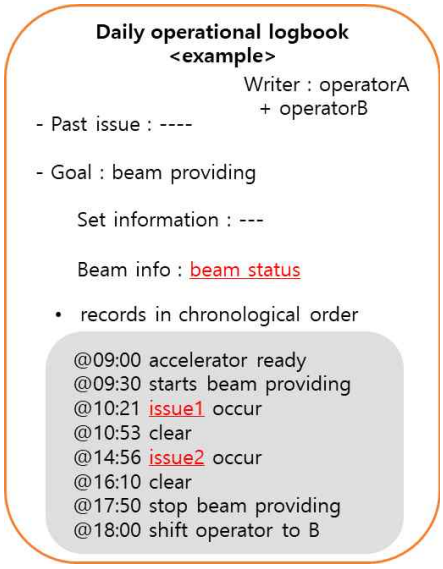

Fig. 3. the example format for daily operational logbook

The machine issue logs, beam-related logs, and others should be able to include various related information. The case of including information may attach capturing relevant interface screens, user-taken field photos, current data snapshots, etc. Snapshots allow for recording the current operational values by extracting the relevant Process Variable (PV) list from the database when clicking on a detailed theme. After that, the feature to load and compare previous logbooks of the similar issue can be provided.

To become a popular logbook to user, robust search and statistical functions need to be provided. Access should be available through keyword-based, time-based, theme-based, and author-based approaches. For instance, if one is curious about anomalies recorded for DTL20 magnet QMP3, relevant information should be accessible by searching keywords such as DTL20, QMP3, trip, fault, etc., or by theme shch as magnet, DTL20, etc. The result should be searchable from all directions, and they should accurately match the user's requests. Furthermore, the display of statistical processing is also important. It is planned to implement automatic statistical processing based on the recorded logbook, enabling easy access to various information.[2]

3. Design of the system for operation logbook

The operation logbook should be accessible from all PCs connected to the control network and user-friendly. To achieve this, we intend to develop a web-based logbook system. The services managing users, logbooks, etc., are developed using Django. Django is a Python-based backend development framework that allows the utilization of various libraries, including Pyepics. Since this library provides the Channel Access (CA) protocol, we can access the value of PVs directly. The database is developed using MySQL, and the web pages are managed using GitLab. The web service is developed using the JS development framework React, and service deployment is done using Docker. The system is represented in the following diagram.

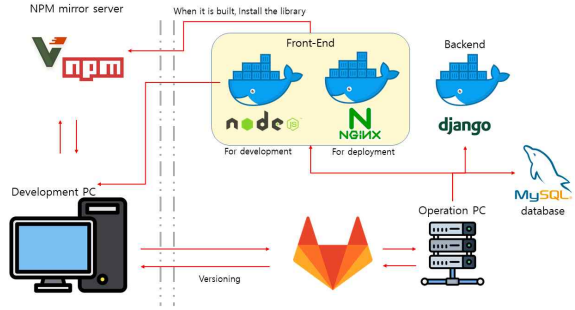

Fig. 4. the diagram of logbook system

4. Plans

The KOMAC operation logbook is developed in two phases: Phase 1 and Phase 2. In Phase 1, the goal is to complete the basic framework of the account authentication system and the logbook system. Phase 2 involves sequentially applying various features such as image attachment, operation data attachment, a robust search function, and statistical processing dashboards, and upgrading. Currently, we are in the process of developing the Phase 1 account authentication system. When Phase 1 is finished, we will deploy this service and simultaneously proceed to Phase 2, sequentially upgrading as we go.

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