



EVOLUTION AND STATUS OF THE E-LOGBOOKS AT ESRF WHITE PAPER (2008)

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In 2004 ESRF moved to electronic logbooks which are now used for document management, the exchange of technical information and - in the Control Room - as a powerful tool for storing and retrieving information at a glance. ESRF has chosen a commercial product developed by j5 International called the j5 Operations Logbook. The j5 Operations Logbook can be tailored by its users and has evolved steadily with time. Thanks to the experience gained by several years of extensive use, a new version which offers extensive customization possibilities has been launched. This new version of j5 allows automatic access to control system parameters. It has been interfaced to the ESRF control system (Tango) through a Python binding. This White Paper was originally presented at the 11th European Particle Accelerator Conference held in Genoa in June 2008. There have been a few edits in October 2015, primarily rebranding "St James Software" and the associated application names to the new corporate identity of "j5 International".



ESRF AND ITS CONTROL ROOM

ESRF - A Brief Description:

The European Synchrotron Radiation Facility (ESRF) is a 6 GeV X-ray source. The accelerator complex comprises a Linear accelerator, a synchrotron and a Storage Ring that have been routinely operating for over 14 years in a 24h/24h mode. The source delivers 5,600 hours of X-ray beam to 43 beam lines simultaneously.

The Control Room:

The operation is managed from the Control Room by a two-person crew rotating over 24h in 3 shifts of 8 hours. The crew must ensure that the beam meets the required operating specifications. To do this, the crew has many diagnostics tools at its disposal. Should a problem occur, the Operator must solve the problem or call and coordinate the experts for finding the fastest possible solution. Many technical and decision-assisting procedures have been set up. The crew is responsible for documenting all their observations, and for actions.

INTRODUCTION TO E-LOGBOOKS

Before 2004:

At that time, most of our procedures were written in a template format and classified in a file. Another set of procedures were written on the Operators' intranet system. Yet another set was available via the Intranet on the WEB pages of different groups of specialists. In the Control Room, all events on the accelerators were hand-written in paper logbooks (30 logbooks per year / 6,000 pages / year!). The main limitation of the hand-written logbooks was the difficulty of retrieving old information when needed. In 2004, we started the specifications for the ideal electronic logbook for the Control Room.

2004 to 2008 - First Experience with Commercial E- Logbook Software:

Several institutes had developed their own e-logbook and offered the possibility of sharing it. These developments fulfilled some of our specifications but none of them satisfied our requirements in terms of flexibility.

At that time, we discovered a product called the j5 Operations Logbook developed by j5 International which had been developed for the industrial market. A study of its capabilities confirmed that it met most of our requirements, either natively or with minor enhancements.

The j5 Operations Logbook can use any standard database (Oracle, SQL Server and Postgres). The software only needed be installed once on a server PC and every user can then access it via a standard web browser. The software is extremely easy to customize to meet particular requirements and anyone who understands the fill-in-the-form procedure can do it without coding. Virtually any kind of document can be attached to a log (e.g. pdf, graphic files like jpeg, png, bmp or videos, Word, Excel and PowerPoint files) and these attachments can be displayed immediately from the log. The same software can be used to create a whole spectrum of applications like logbooks, reports, document repositories, work permits etc.

The software layout is so intuitive that there is no requirement for special training.

ESRF SPECIFIED ENHANCEMENTS

Additional features were added to the application to meet ESRF’s special requirements:

- The enhanced filtering and searching capability (Fig. 1) enables a user to locate a log quickly by selecting options from multiple fields and locate specific text within the attached pdf files – for example - a user may want to display all “failures” from the “klystron” of the “Radio-frequency” system in the last 7 days
- Special fields allow experts to add explanations or corrective actions to logs entered by operators
- A gallery for screenshots was added to the application and thumbnails of the screenshots were shown in each log

The screenshot shows the j5 Operations Logbook interface. At the top, there is a search filter with a range of '200' days, a date '20/01/04 19:46:3', and buttons for 'Confirm filter' and 'Cancel'. Below the filter are dropdown menus for 'Accelerator', 'Equipment', 'Beam_type', 'Event' (set to 'BEAM LOSS'), and 'Machine state'. A 'Message' field is also present. Below the filter is a table with columns: Date, Time, Beam_type, Event, Machine state, Accelerator, Equipment, and Message. The table contains two rows of log entries.

| Date | Time | Beam_type | Event | Machine state | Accelerator | Equipment | Message |
|------------|----------|-------------|-----------|---------------|--------------|-----------|-------------------------------|
| 24/10/2003 | 14:44:06 | 1/3 filling | BEAM LOSS | MDT | Storage Ring | VACUUM | Beam loss at 2 vacuum fault 0 |
| | 14:26:53 | 1/3 filling | BEAM LOSS | | Storage Ring | VACUUM | Beam loss at 2 vacuum fault 0 |

Figure 1: An Example of a Filter in Action

- An enhanced User Permission system was created, giving fine grain control of who can perform an operation
- Multi-key combo options were added so that a user can accurately describe situations that cover multiple overlapping areas
- Special procedural business rules were added - for example - the system forces selected users to read system status information at the start of the shift
- A powerful emailing system was added; an email or an SMS can be sent out to a selected group of recipients (i) if the conditions in the log meet a configured requirement, (ii) if the crew wants a list of recipient to be informed of the log or (iii) at a scheduled time during the day

Intermediate Project:

Moving definitively to a Control Room Electronic Logbook was not a task to be taken lightly and its potential irreversibility required thorough groundwork. We decided to move forward with intermediate projects.

Control Room Procedures:

The first project was to create a database with all the Control Room procedures. This includes technical documentation linked to all types of equipment, minutes of technical meetings, safety procedures, etc. Each of these documents was classified into one or several subcategories.

E-Logbook in a Group or Beam Line:

The Power Supply Group of our Accelerator Division uses the j5 Operations Logbook as an internal e-logbook (Fig. 2). They classify their equipment into different classes. The event types are classified as 'modification', 'intervention', 'failure', 'upgrade' or 'alarm'. The filtering feature provides the history of the work carried out on a given piece of equipment. When the event option is a "failure", an automatic email is immediately sent to the whole group. Since then, several other groups and beamlines have now adopted the j5 Operations Logbook for internal technical archiving and exchange purposes.

Add Modify Delete Filter 0 days 09/06/04 14:49: Print Form Options Configure Help Logout logged in as admin

User Name : lagarde Event Date : 03 Jun, 04 Event Time : 10:00 PM
 Area : SRTU Message : A link earth was detected on QD4/C12.2. During cable removing, disappeared: is it a mechanical shock which removed the copper pipeline of magnet ? Strange problem... Now the QD4 family has
 Equipment : Magnet
 Mode : Shutdown
 Event : REPARATION
 Attachment : (no attachment)
 Log History : 2004060417013300-audit.txt

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| Event Date | Event Time | Mode | Area | Equipment | Message | Event Type | User | # |
|------------|------------|----------|-------------------|-----------------------|--|--------------|---------|---|
| 04 Jun, 04 | 03:45 PM | Shutdown | SRDC | Bruker | Adding a new delay relay to get a good working of DCCTs -/+15V power supplies after removing LOTO. But, the relay didn't work correctly and all channels of MS9 were into full current which create a short-circuit on 10mm2 cables with 100A. The reason is current's measurement wasn't returned into regulation board because all DCCTs weren't supplied correctly so the system worked as a open loop regulation. A new system protection will be designed in futur... | MODIFICATION | lagarde | |
| | 02:19 PM | MDT | SRTU | Magnet Interlock | default d'eau sur s24 c05 debimetre ok cablage ok relais ok ??? on exchange en preventif les 3 relais | ALARM | fene | |
| | 10:44 AM | | CTRM | Control System | Two categories have been added in the main panel of PsgCtrl : -> TL1-PS -> TL2-PS. You can open the associated applications(tl1 & tl2) by clicking on the button in the main panel. | MODIFICATION | goudard | |
| 03 Jun, 04 | 10:30 PM | Shutdown | SRDC | Hazemeyer | All tests with SRUPS was performed with QD1, QF2, QD3, Qd4 and QF5 family. We didn't detected any current overshoot during cycling ramping. | INFORMATION | lagarde | |
| | 10:00 PM | | SRTU | Magnet | A link earth was detected on QD4/C12.2. During cable removing, the problem disappeared: is it a mechanical shock which removed the copper deposite in pipeline of magnet ? Strange problem... Now the QD4 family has 450Kohms | REPARATION | lagarde | |
| 01 Jun, 04 | 09:59 AM | | Technical Gallery | Vacuum Vessel Cooling | fin du passage de l'ensemble des 32 racks en masquage a 0.5s un controle de tous les racks est effectue par un test cle en local le bilan est le suivant cell 13 led fl12 et led 5v hs cell 14 led fl2 hs cell 20 led 12v ac | INFORMATION | fene | |
| | 09:53 AM | | SRTU | Vacuum Vessel Cooling | fl4h cell 17 le debimetre ne coupe pas l interlock probleme de cable mecaniquement blesse et donc en courtcircuit apres reparation l interlock refonctionne il est preferable de changer le cable complet lors du prochain arret | FAULT | fene | |
| | 09:50 AM | | SRTU | Magnet Interlock | default vigitherm sur qd6 c11 mauvais serrage dans le bornier en porcelaine ok | FAULT | fene | |
| | 09:47 AM | | TL2 | Magnet Interlock | deplacement des 2 debimetres de chaque dipole de tl2 (hors coffret en bois) | MODIFICATION | fene | |

Figure 2: The Power Supply e-logbook

Control Room Electronic Logbook:

Once we were satisfied that j5 Operations Logbook met all the requirements, we built the structure of the Control Room e-logbook (Fig. 3). This logbook was welcomed by the Operators. The emailing feature, thumbnail facilities and filtering capabilities were particularly appreciated.

Add New Edit: Modify Delete Filter: New Edit 0 days 25/05/2008 Log Date [Sunday] Time [16:12] Run http://plog2:90/demo/main_form.php

Machine Mode USM
 Filling Mode 4 * 10 mA
 Event Failure (NO BEAM)
 Failure duration (min) 20
 Accelerator SR
 Equipment SRRF
 Sub-Equipment CAVITY 3/4
 Type of event Arc Detection
 Intervention type
 E-mail To radiofrequency
 Additional e-mails

Log Date 25/05/2008 Log Date [Sunday] Time [16:12] Run http://plog2:90/demo/main_form.php

Message C.Niclas : cavity 4 arc paper 3
 C.Niclas :
 since last intervention, is now clearly present.
 C.Niclas :
 gaps in INJECTION : we reached relatively easy 40 mA ; the saturation effect has been visible when SR_current about 36mA we didn't change the INJ_AMPL (-12.4mm) and the SY_current was around 0.35mA
 C.Niclas : INJECTION blocked by FE/ID/3 ; connection lost OFF/ON of L-c03-1 performed and the control has been reestablished again
 FE_interlocks in INJECTION

| | | | | | | | | | | | | |
|---------|--------|------------|-------|-----|-------------------|---------|-------------------------|--|--|--|--|--|
| 2008-02 | Sunday | 25/05/2008 | 16:36 | USM | Back to USM | | | | | | | |
| 2008-02 | Sunday | 25/05/2008 | 16:31 | USM | Start refill | | | | | | | |
| 2008-02 | Sunday | 25/05/2008 | 16:30 | USM | Failure (NO BEAM) | Control | Linux & Windows Crashes | | | | | |

Figure 3: The Control Room e-logbook

E-LOGBOOKS EVOLUTION IN 2008

The next important step for ESRF was to connect the e- logbook with the Tango control system.

About Tango:

Tango is a control system framework based on distributed objects using the CORBA protocol. ESRF initially designed it in the year 2000 and since then, it has been adopted by several light sources in Europe under a collaborative development agreement. The collaborating institutes are SOLEIL, ELETTRA, ALBA and recently DESY for the control of PETRA 3 beamlines. Each collaborating institute engaged itself to use TANGO to control their accelerator and/or beamlines and agreed to participate in the development and maintenance of TANGO. Tango's key concept is the "device server". Each device is "exported" over the network and offers an interface which can be used to read signals or perform actions on the device from any computer of the network.

About j5:

j5 is the next generation logbook built using the j5 Operations Logbook and the wealth of practical experience at ESRF. The j5 application includes a real-time resource ideally suited to the connection with Tango.

j5 / Tango - Interfacing and Results:

Our first step was to get the j5 Operations Logbook to read the storage ring current and store it in the e-logbook. The goal was to generate automatic messages containing operation parameters read from the Tango history database (Fig. 4). j5 is configured as a subscriber for Tango events. When Tango sends events, j5 generates automatic logs.

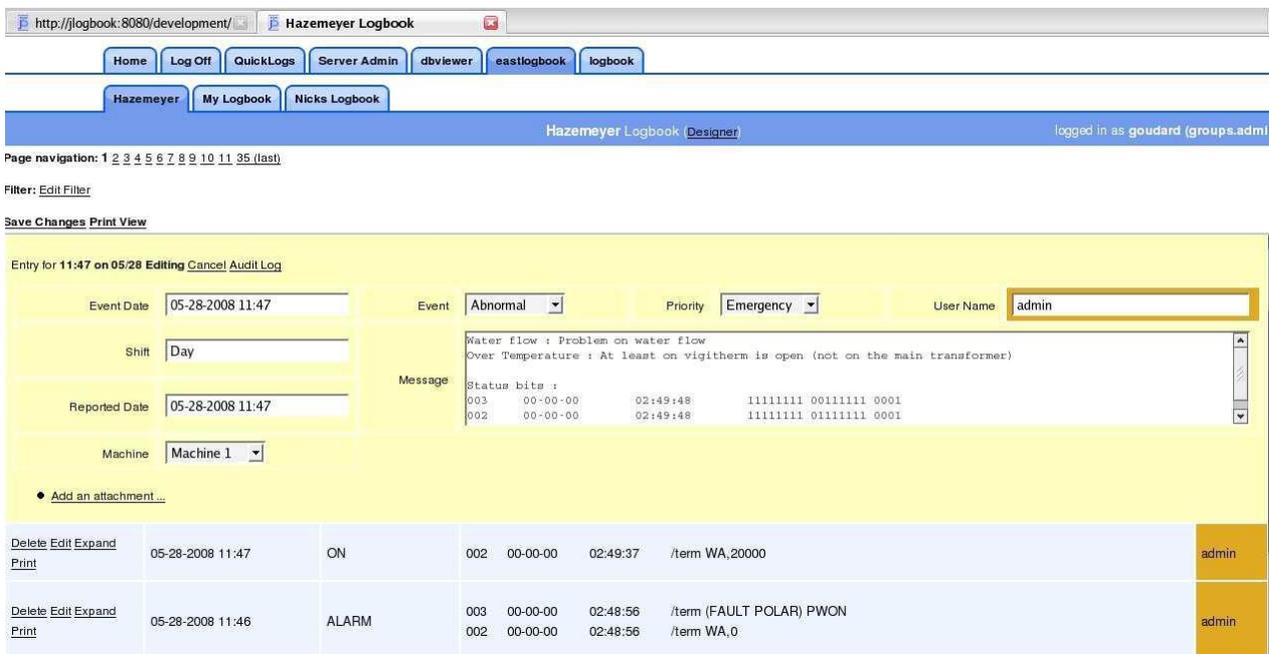


Figure 4: Example of an Automatic Log Addition

In our next step, we linked in the former storage ring power supply's (SRPS) history loggers. The logbook subscribed to the "CHANGE" event of each SRPS TANGO device server. Thus, any power supply problem is now automatically logged.

ADDITIONAL j5 FACILITIES

In addition to the Real-Time resource, j5 has steadily evolved to meet the special needs of ESRF:

- j5 system filtering has been substantially improved and integrated into the main page, additionally, custom filter buttons can be configured to meet the needs of frequently used filters (Fig. 5)

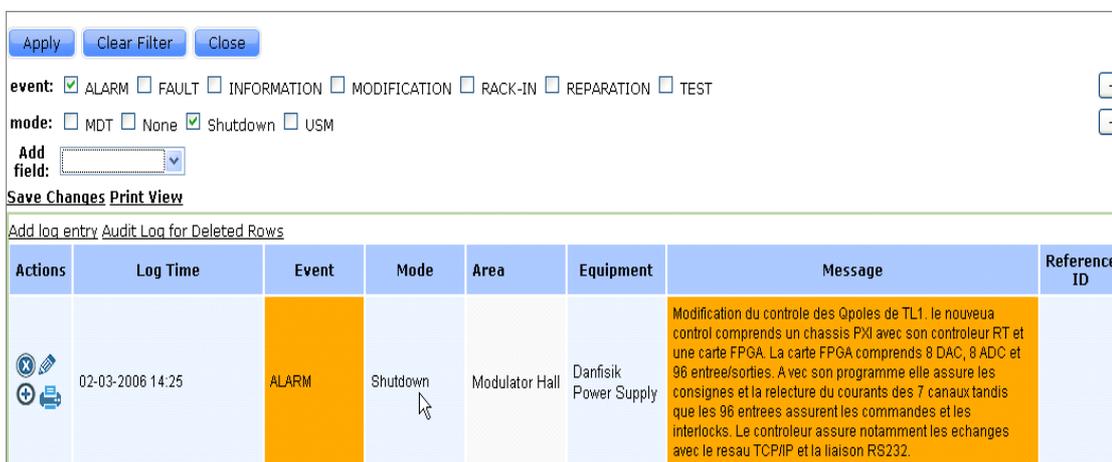


Figure 5: A Powerful and Customised Filtering System

- j5 provides a Tab Based Framework for the hierarchical management of multiple logs, Logbooks per individual beam lines can now be implemented and managed efficiently
- A new wizard based configuration system has been added, enabling fast creation of new logbooks
- New and more representative visualizing forms including charts, photographs and special scriptable buttons are configurable through a wizard
- LDAP authentication enables the centralized management of large numbers of users
- Provision of standard applications like Work Permit, Inspection Rounds, Alarm Management etc.
- Logbooks can be accessed via PDA's like the iPod to allow remote access (Fig. 6)

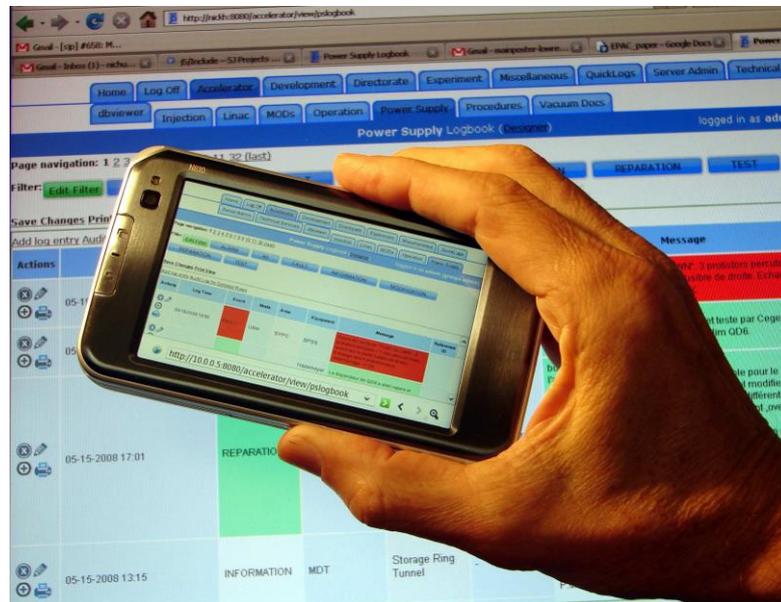


Figure 6: Remote Logbooks Delivered via a PDA

- j5 can have logbooks within logbooks, these sub-logbooks are especially useful, for example, when a main event has several sub events
- Dashboard type logbooks and "ripple through reporting" allow the scheduling of daily, weekly and monthly PDF or spreadsheet reports
- Third party software can access the logbooks
- Logs of one logbook can hotkey to a specific log in another logbook
- j5 connects to Tango via Python to access any Tango device attribute around the accelerator
- It runs on Redhat Linux or Windows and MySQL
- j5 is installed on a dedicated Linux machine (DELL Poweredge®, with RAID1 controller and redundant « hotplug » power supply), backup performed with Time Navigator®

CONCLUSION

After 4 years' experience of using the j5 Operations Logbook, we confirm that we are fully satisfied with the product we chose 4 years ago: all the functionalities which we required (and even more) have been implemented. Its modularity and the fact that it could be tailored to our needs was an asset. It is currently so flexible and powerful that it is easy to adapt the structure to most projects needing a database: it can be used not only in the Control Room but by any group or beamline to archive technical data or carry out troubleshooting procedures, work permits, follow-up of failures, etc. The j5 Operations Logbook has been interfaced with our Tango control system which was a major step to generate filtered automatic logs. The interface can be adapted to any control system making this electronic logbook an added value not only for the Tango community but for any particle accelerator.



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