Glance Information System for ATLAS Management

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Abstract. ATLAS Experiment is an international collaboration where more than 37 countries, 172 institutes and laboratories, 2900 physicists, engineers, and computer scientists plus 700 students participate. The management of this teamwork involves several aspects such as institute contribution, employment records, members' appointment, authors' list, preparation and publication of papers and speakers nomination. Previously, most of the information was accessible by a limited group and developers had to face problems such as different terminology, diverse data modeling, heterogeneous databases and unlike users needs. Moreover, the systems were not designed to handle new requirements. The maintenance has to be an easy task due to the long lifetime experiment and professionals turnover. The Glance system, a generic mechanism for accessing any database, acts as an intermediate layer isolating the user from the particularities of each database. It retrieves, inserts and updates the database independently of its technology and modeling. Relying on Glance, a group of systems were built to support the ATLAS management and operation aspects: ATLAS Membership, ATLAS Appointments, ATLAS Speakers, ATLAS Analysis Follow-Up, ATLAS Conference Notes, ATLAS Thesis, ATLAS Traceability and DSS Alarms Viewer. This paper presents the overview of the Glance information framework and describes the privilege mechanism developed to grant different level of access for each member and system.

1. Introduction

ATLAS is an international collaboration of more than 3000 individuals who have to work together as a team while being thousands of miles apart. To manage this collaboration it is required to handle data about members, institutes, papers, conferences, the internal structure

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and equipments. For example, only employed members are able to access ATLAS restricted information, as meeting agendas and presentations, statistics and physics results before they are published. Therefore, the collaboration has to be sure that all members' employment records are up-to-date. Another example is for publishing a paper, it is a process that has several steps and phases and it depends of different ATLAS Committees. One step can only be accomplished after the previous one is finished, so the Committees need to be aware of the paper status and other groups' activities in order to publish the paper in the proper time. A common task is to qualify members to become authors. It is a procedure that has to be approved by collaborators who may be away from CERN site. On the equipments area, for example, ATLAS has to guarantee that radioactive equipments are properly moved and stored according to French and Swiss laws and that all the alarms that can be activated during an emergency in the cave have their procedures and output actions in a reachable place.

These activities are not necessarily related to each other, they handle data that will be analyzed by distinct groups of people that may have different purposes for the same data set. Furthermore, the users are usually physicists, engineers, technicians or administrators that are not specialist in database programming language and may not know the modeling of the data inside the repository. All these requirements describe the need to use a system that can be accessed anywhere, easy to maintain, able to apply security restrictions and that retrieves and update data from different repositories.

This article presents the several systems that compose the Glance information framework, built to support ATLAS Management activities. The privilege mechanism structured inside it is then presented, followed by its architecture.

2. The Glance Platform

The Glance Retrieval Tool is Application Programming Interface (API) that performs data retrieval and insertion/update in distinct and geographically spread repositories. [1] The systems that compose the Glance Platform use this API to retrieve, parse and format data from the database and then display it in a web interface. Using this tool as a first application to access data, it was possible to build several systems in different areas to support ATLAS Management and Operations. These systems will be described below, separated in 3 major groups: management of members, management of papers and operations.

2.1. Management of members
This subsection describes the systems developed to give an overall perspective about a member's activities inside ATLAS.

2.1.1. *ATLAS Membership.* It gathers the main deeds performed by the collaborators and divides the members in categories according to their produced work. These categories are used to produce authors' lists for ATLAS papers by selecting only the collaborators that are in the authors group. The yearly breakdown of maintenance-and-operation (M&O) and operations tasks (OT) quotas can also be found in this system. The database also supports the work of the Authorship Committee by implementing the qualification procedure. It guides the user step by step through the process, sending a warning e-mail indicating it is the collaborator's turn to input data in the system and keeping the other members involved aware of the events.

2.1.2. *ATLAS Appointment.* In ATLAS internal organization there are job positions for which members will be assigned [2]. It is possible to define their properties such as the period of the mandate and the member assigned to each appointment. The most important aspect is the privilege schema built upon on it, which will be explained in details in section 4.

2.1.3. *ATLAS Speakers.* The speakers that will represent ATLAS in international conferences are selected by the Speakers Committee (SC). However, it is the Speakers Committee Advisory Board (SCAB) that prepares a list for whom should be given priority in this selection. The ATLAS Speakers

system supports this activity by offering a way of nominating potential speakers and creating the list through a search tool with several criteria. Among the functionalities provided by this system is also the visualization of histograms analysing the number of nominations and talks per institute, per country, per year and other options.

2.2. Management of papers
This subsection describes the systems used to advance and to monitor the progress of ATLAS papers.

2.2.1. *ATLAS Analysis Follow-Up and Conference Notes.* The ATLAS Analysis is divided in two systems, one dedicated to the elaboration of papers and the other one to manage conference notes. Both support the process of revision, approval and publication of papers and analysis. It divides the procedure in 3 phases: in the first one an Editorial Board is defined, a draft is presented to the ATLAS Community and the Authorship Committee starts producing the author's list. The highlight of the second phase is the presentation and approval of the final draft by ATLAS. The third phase, also called as "Final Submission", involves presenting the final draft to the CERN Community and submitting it to the Journal. Among the functionalities presented in the system are: search for analysis records, definition of an Editorial Board and Reviewers for each analysis, an e-mail sender to warn about presentations and revision periods and a documents and reviews tracker in CDS (CERN Document Server) and arXiv.

2.2.2. *ATLAS Thesis.* It works as an ATLAS theses filter for CDS. From this system it is possible to access the link to the thesis in CDS or the author's profile in Membership. It is also possible to check the type and status of each thesis and its institute and country.

2.3. Operations
In this subsection the systems that focus on equipment handling, security and transport will be described.

2.3.1. *ATLAS Traceability.* During the operation, maintenance, and dismantling periods of the ATLAS Experiment, the traceability of all detector equipments must be guaranteed for logistic and safety matters. The system has been developed to track location, to monitor radiation, and to insert, to retrieve and to modify the data concerning around 110.500 equipments within the detector facilities.

2.3.2. *DSS Alarms Viewer.* The ATLAS Detector Safety System (DSS) [3] has dedicated sensors that trigger alarms when exposed to dangerous situations such as fire and leaks of gases and cryogenic liquids. The system gathers all the relevant information about an alarm such as the respective procedure in case of emergency, as well as its triggering conditions, its output actions with their latency time and its history.

3. The Privilege Mechanism
According to the member's role, privileges will be assigned to the user; they are granted at login time and they are valid only for one session. To login, the CERN Single Sign-On solution [4] with the Shibboleth Apache module is used. They provide identity information as the CERN CCID, which is used to recognize the collaborator in ATLAS DB and grant the respective roles as well as record in the repository the responsible for the updates.

Every time a session expires, the user is redirected to the privilege assignment phase. There, the CERN CCID is used as a parameter to retrieve the collaborator's rights and set the variables with different levels of permission. There is a login attribute common for all users and if it is set, it means that the collaborator already passed through the privilege assignment phase and holds all the grants allowed.

The verification of the granted rights is rendered as the interface is being displayed. For each group of information and functionalities the permission will be checked. As they are independent of each other, the same interface can be shown to all the users by setting different options of presentation to each possible level granted.

For example, while in the ATLAS Speakers the SCAB Chair can make nominations in behalf of the Project and Team Leaders, the regular users can only do it as themselves.

4. Architecture

Search Interfaces (SI) are a XML description, made with predefined tags, of a data source connection and its attributes [1]. Each of the Glance Platform systems through a HTTPS (Hypertext Transfer Protocol Secure) web link is able to establish communication with the Glance Retrieval API, which is the responsible for interpreting the HTTPS link to choose the correct SI and parameters. Then, the API will initiate a connection with the database indicated by the SI and make a query according to the attributes previously written in the link.

Every Glance web application can access all the SIs, this allows sharing information among them. Figure 1 shows a schema of how the applications contribute with it. To grant access to private data or advanced functionalities, the systems retrieve the roles performed by the user defined in ATLAS Appointment (g). These roles are associated to privileges (e) and these privileges control the access to determined features in the systems. The member information is also shared among the applications (d). In ATLAS Membership (f) it is possible to check all the data previously entered in one of the other systems. The other way around is also possible: for example, to nominate a person as a speaker in conference through ATLAS Speakers (c), the potential speaker has to be a qualified author, which was defined in ATLAS Membership (f).
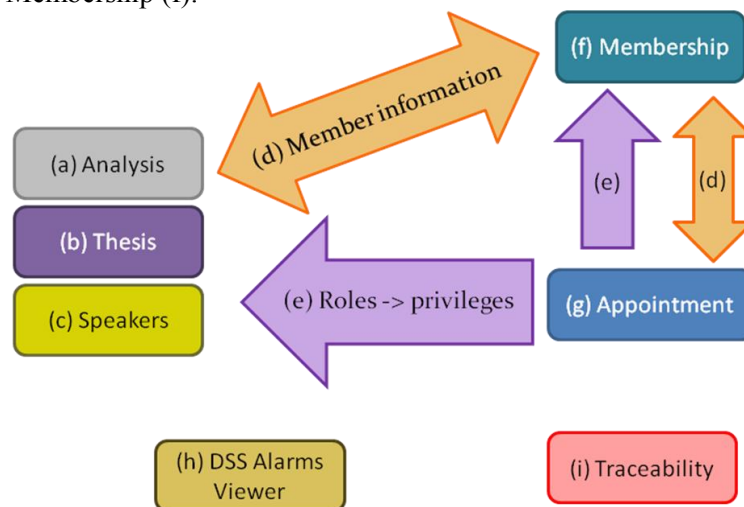

Figure 1. Trade of information inside the Glance Information Framework.

Currently, all the data accessed is stored in Oracle databases. The ATLAS Experiment uses private repositories, separated from other experiments and from the general CERN DB. However, as a collaborator also has a profile in the CERN DB, a database connection between it and the ATLAS DB is necessary to keep them synchronized. To update the repository, the applications receive the user's input and send it to the server via the Common Gateway Interface. Programs in C++ were created to establish communication with the server, decode the user's entry, create a database connection to the Oracle repositories and finally, perform the commands necessary to accomplish what was requested by the user. This is achieved by using the GNU CgiCC library to connect to the server and the OCCI library to enter in the database. When the quantity of records to update is too large, it's useful to transfer to a CGI this information in a unique XML description, instead of transferring several pieces

of data separately. In this case, to interpret the input, the programs use the Xerces-C++ library to parse the information before sending to the database.

All the web interfaces were built using php language, Javascript and AJAX for dynamic interactions with the user and validations. Also, the systems ATLAS Membership, ATLAS Traceability and ATLAS Speakers make use of Java applets.

5. Conclusion:

As the experiment has a lifetime of 15 to 20 years the management applications should be flexible enough to support data modeling improvements, new functionalities requirements and adjustments and constant changes of members and roles. With the development of the Glance Retrieval API it was possible to create and maintain management systems in different areas that can be correlated or not and have the same repository or not. The privilege mechanism allowed that a single interface can be available for all the members and also encouraged the decentralization of ATLAS activities, once it controls the level of permission for each group of data, being possible to assure that the members will only access and change the data concerning themselves.

Currently, all the conditions that rule the systems are integrated into the code. In order to keep making the Glance Information Framework more adaptable, the next steps consist in making explicit the rules that run the systems and transfer them to a configuration file. It will be possible for specific users to edit this file and organize by themselves the system.

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