Service management at CERN with Service-Now

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Abstract. The Information Technology (IT) and the General Services (GS) departments at CERN have decided to combine their extensive experience in support for IT and non-IT services towards a common goal – to bring the services closer to the end user based on Information Technology Infrastructure Library (ITIL) best practice. The collaborative efforts have so far produced definitions for the incident and the request fulfilment processes which are based on a unique two-dimensional service catalogue that combines both the user and the support team views of all services. After an extensive evaluation of the available industrial solutions, Service-now was selected as the tool to implement the CERN Service-Management processes. The initial release of the tool provided an attractive web portal for the users and successfully implemented two basic ITIL processes; the incident management and the request fulfilment processes. It also integrated with the CERN personnel databases and the LHC GRID ticketing system. Subsequent releases continued to integrate with other third-party tools like the facility management systems of CERN as well as to implement new processes such as change management. Independently from those new development activities it was decided to simplify the request fulfilment process in order to achieve easier acceptance by the CERN user community. We believe that due to the high modularity of the Service-now tool, the parallel design of ITIL processes e.g., event management and non-ITIL processes, e.g., computer centre hardware management, will be easily achieved. This presentation will describe the experience that we have acquired and the techniques that were followed to achieve the CERN customization of the Service-Now tool.

1. Introduction
CERN has decades of extensive experience in providing organization-wide services. Many commercial and in-house software solutions run processes that orchestrate these services. Nevertheless there are some centralized services that are common components in all software tools at CERN. Namely, these are the CERN authentication service and the oracle databases that describe all the assets of the organization and their relations. Service-now has been integrated with many of these tools at CERN, in order to facilitate transparent service management processes in the organization.
2. Initial tool configuration
Before Service-now could be used in production by the CERN community, it was necessary to populate the tool with a minimum set of configuration data. Most of these data fit in the Configuration Management Database (CMDB) of the tool, e.g., the service catalogue components, tool users, the CERN organisation structure and several types of application roles. As that information already existed in the central databases of CERN, we fed the data from CERN to Service-now (Fig 1).

All the CMDB items that have been extended with CERN specific fields: building purpose, user home institute, etc. Extra relations between some configuration items (CIs) have been defined as well (e.g. deputy organic head, location responsible). Some of these relations are recursive, for instance the CERN organisation structure and the buildings have been implemented in Service-now as cycle dependency of the Department and Location table respectively.

Fig 1. Synchronisation of configuration data with CERN Oracle Databases

2.1. Service Catalogue
The implementation of the service catalogue in the tool was an essential part of the initial configuration. It has been a challenge to design in Service-now structures that accommodate the two-dimensional service catalogue. The “user view” axis of the catalogue represents a three level hierarchical structure: Service Areas (SA) that contains Customer Services (CS), which are further broken into Service Elements (SE). Every level of the hierarchy has been implemented in Service-now as a table that extends the Business Service table and it is linked with its hierarchical predecessor by a parent-child relationship. The “support team view” axis comprises another hierarchical structure that has the CERN organisation structure as branches and functional elements (FEs) provided by the organization as leaves. The FEs have been implemented as an extension of the Business Service table as well. The weight of the dependency of the SE on the FE has been carried out in the tool as a CMDB CI relation.

The service process document [2] defines the notion of roles granted to different targets in the service catalogue. The design of the authorisation schema that is based on service catalogue roles has confronted us with a limitation in Service-now. The access control policy of the tool provides static assignment of roles to people or to groups of people. The role privileges are granted on a table level rather than on a record level. In order to achieve record-level access control, the service catalogue roles have been realised in Service-now as group assignments. These group assignments are synchronised twice per day from the CERN “Roles” application. At the same time Service-now exports the service catalogue to a CERN Oracle database, from where it is used by other applications, like the CERN phonebook.
2.2. CMDB Evolution
The experience acquired through designing and running processes with Service-now for almost two years has proven that configuration data are live. They need to be scrutinised regularly and extended gradually, depending on the needs of the implemented processes. Recently the CMDB has been extended with equipment items, the repair contracts under which the equipment items work and the CERN organisation unit budget codes. These new CIs have been introduced in order to facilitate the integration with other tools at CERN.

2.3. Other initial configurations
CERN carries on years the legacy of email support for ticket submission and updates. The approach is that support line emails are redirected to an incoming mailbox of the Service-now instance, where the emails are processed. Each support line email is mapped to a service element, a functional element and type of the ticket that is going to be created out of the email. Although the email submission is not advertised, it has been kept for a transition period till the end users start to get used to the new CERN service portal.

Another important customisation is the Single Sign-On integration of Service-now with the CERN Security Assertion Markup Language (SAML) authentication services. There have been issues with unsigned Sign-Out request on SAML 2.0, which were recently successfully fixed by the CERN developers.

3. Incident Management and Request Fulfilment
The incident management and request fulfilment processes are essential parts of service management at CERN. Naturally, these two have been first implemented processes in the Service-now tool. Briefly, the incident management process aims at the fastest possible restoration of a service, whilst the request fulfilment process is targeted at delivering value to the users in the best possible manner. Despite the different application, these two processes have some common basic features.

3.1. Common features of the CERN ITIL processes
A CERN specific customisation of the tool is the presence of the Service Element, Functional Element and the corresponding dependency weight in the tickets handled by all ITIL processes. Another common requirement is the concept for three visibility levels for the tickets in the system. Namely, a ticket to be visible for the whole organisation, another to be visible by the end user and all supporters and in the last and most restrictive level of visibility a ticket is shared only between the end user and the concerned support unit. The common features of the CERN ITIL processes are implemented in the Task table, which is the basic ticket table in Service-now. There are numerous customisations made of the Task table and a small list of the most used ones is shown:

- Functional Managers can define an extra categorization of the ticket in his Functional Element.
- Support people can switch off the user notifications at any state of the process workflow.
- Many fields are introduced because of the integration with external third party workflow systems: external caller, identifier of the ticket in the imitating third party system, URL of the ticket in the resulting third party system, number of processed items, etc.

The modifications made on Task table are important for running the whole tool, as this table is inherited by the incident, request fulfilment, change request and many other tables in the system.

3.2. Incident Management
Incident management is implemented by extending the out-of-the-box Incident table with extra fields, like the “parent incident”. The process itself has been realised as a state machine. For each state of the incident the possible transitions to other states are defined. The process creates the ticket in state “new” and automatically passes the ticket to state “assigned” to a support group. Service Desk is the default support group for each functional element, but there are also second and third level support
groups provided. For some functional elements there is also Outside-Working-Hours (OWH) support group defined, to which a ticket is automatically assigned if it arrives in the system during the official OWH time for CERN. Once a ticket is assigned to a group any member of the support group can take it “in progress”. At that moment the supporter can perform several actions:

- start working on the incident,
- request additional information from the caller,
- send the incident to a third party system,
- create a change out of the incident,
- link the incident with an existing incident for the same issue,
- resolve the incident.

At resolution time, the supporter provides a solution and chooses a close code from a predefined set of codes. The caller can reply to the incident in three working days. After three working days the incident is automatically closed and no further actions can be performed on the ticket.

3.3. Request Fulfilment

The request fulfilment process is more complicated than incident management in terms of states and properties. A classification stage in the request process serves to categorise the request in the proper functional element and escalate it to the appropriate support level group. Once a request is escalated for fulfilment, the request states and the possible transitions between them are almost the same as the ones for the incident ticket. The only difference is that a request cannot be waiting for a parent request and at the same time a request can be waiting for approval. There are four types of approvals which the supporter can ask for: confidential, functional, technical and financial. For the last type of approval, an amount and a budget code are additionally provided in the request ticket. After the required approvals have been obtained, the supporter continues to work on the ticket. The resolution procedure is similar to the one in the incident management process, only the close codes are different.

The implementation of the incident and request fulfilment processes also permits a request to be transformed to an incident and vice versa. In both cases the original ticket is marked as resolved and it contains a reference to the related ticket while the related ticket holds a reference to the resolved parent ticket.

4. Integration with Third Party Systems

Integrations with other systems ensure that Service-now can be used as:

- a single point of entry by the end users,
- a single tool for the supporters to manage the tickets in their functional element,
- a single place for the functional managers and service owners where to monitor the level of their services.

The integration with third party systems has been done steadily in order to verify the stability of each phase of the integration. At the moment at CERN, Service-now is fully integrated with the WLCG Ticketing System (GGUS) [3] and partially with the equipment and maintenance job management systems INFOR [4] and JMT [5].

4.1. Integration with GGUS

The integration between Service-now and GGUS is executed with web service calls in both directions. The GGUS ticket creates a Service-now incident by calling the out-of-the-box create incident web service method, having ensured that the incident will be properly assigned to the GRID functional element. Since that moment the supporter on the Service-now ticket is responsible for resolving the issue. Any change of the incident state, comments or attachments is propagated back to the GGUS ticket by a web service call. The supporter of the GGUS ticket is also able to send an update to the Service-now incident. (Fig 2)
Recently full integration between GGUS ticket and a Service-now request has been implemented and also the possibility to update a GGUS ticket if the corresponding ticket in Service-now has been transformed from incident to request or vice versa.

4.2. Integration with INFOR and JMT

INFOR is a third party contractor ticketing system that is used to track equipment repairing work at CERN, e.g. water leaks, electricity problems, mechanical work, etc. JMT is a ticketing system that runs the maintenance jobs executed with the CERN infrastructure, e.g. office cleaning. In the integration with both systems, Service-now creates a ticket providing all the information needed to the third party system. Recently, the creation of the INFOR ticket has been migrated from an asynchronous call of an APEX page to a synchronous web service call. The later approach ensures that the web service response is automatically stored in the Service-now ticket. In the JMT integration, a PL/SQL procedure is called, which runs a web wizard that is prefilled with information from the Service-now ticket.

The feedback about the ticket updates in both JMT and INFOR system is pulled hourly from an Oracle relation database. The synchronisation process on the Service-now side updates the work notes of the corresponding incident or request with the latest feedback received. (Fig 3)

![Fig 2. Integration of Incident management with GGUS; Service Level Agreement](image)

5. Knowledge base system

Another process that has been implemented in Service-now is the knowledge base system. In particular, an editorial process for article submission has been put in production. The process starts with a knowledge base submission where the author assigns the article to a functional element, defines the visibility level of the article (CERN wide, public, functional element or set of groups) and sets some extra information such as the expiration date and next revision date. Once the submitter considers the article ready, he/she sends it for review to the functional managers of the functional element to which the article is assigned. The manager can return the submission back to the submitter or send it further for a layout review. Only after the layout reviewer approves the submission, it becomes a published article.

The workflow provides some extra features as: un-publish an article for reviewing at any time, notify the article creator for an approaching expiration date, archive an article.

At a later point, a knowledge base article can be searched for directly from an incident or a request. Lookup functionality filters the appropriate knowledge base articles by the functional element.
and the short description of the ticket. In addition, the supporter has the option to include directly the content of the knowledge base article in the ticket which he is working on and to send it back as a solution to the end user.

6. CERN Service Portal
CERN has developed its own service portal in the Service-Now environment. The portal provides an attractive graphical representation of the service catalogue and the possibility for the end user to see and interact with his active incidents and requests.

A useful feature of the Service Portal is the integration of the predefined incident and request submission forms, called record producers. The record producers represent a set of questions that will assist the end user in defining his request. These record producers are internally linked to a functional element and/or service element of the service catalogue and can be found by browsing the service catalogue or through the powerful portal search. Using a record producer has several advantages for ticket creation in comparison to sending an email to a support line:

1. The support unit that is going to handle the ticket is correctly identified by the system
2. The needed information for the supporters has been provided at submission time (avoid the need to ask by email clarifying questions, ask for extra information)
3. The user’s answer is validated for correctness by the system (avoid a request for a non-existing asset)

These features of the record producer speed up the ticket processing time and increase the user’s satisfaction.

The end user can also find in the portal a knowledge base article that gives him the information they he needs or guides him to the proper procedure to accomplish his needs.

![Diagram](image)

**Fig 3. Integration of Request Fulfilment with INFOR; Service Portal, Knowledge base**

7. Service Level Agreement (SLA)
The Service Level Agreement functionality has been put in production for incident tickets almost since the first release of the system. The SLA calculations have been running mainly for collecting statistics on incident resolution times for different incident priority levels. Recently, functionality for managing the SLAs per service element has been designed and released. The notifications for elapsed and breached SLAs are switchable per service element.

8. Current development and future plans
A lot of efforts have been put in the design and customisation of a common change management process that suits both the GS and IT department needs. There is still ongoing work implementing new customer requirements. Feedback functionality has been released for the end user to provide feedback at any stage of the ticket for any support group which the ticket has passed through its life time.
A prototype of an event management workflow has recently been developed. It has been successfully integrated with the Lemon Alarm System (LAS) [6] and has proved that we can create a solution that will replace the current even management system “ITCM” [7] in the CERN computer centre. The implementation of the event management process will require extension of the Service-now CMDB with the data for the servers in the computer centre.

Problem Management and Risk Management are another two processes under discussion and design.

9. Acknowledgment
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References
[1] Service-now documentation - http://www.service-now.com/
[2] “Service Management for CERN”
[3] GGUS – http://www.ggus.org
[4] INFOR - https://espace.cern.ch/cmms-service/default.aspx
[5] JMT - https://edms.cern.ch/jmt/plsql/jmtw_job.home?cookie=2594514
[6] LAS – LEMON - LHC Era Monitoring for Large-Scale Infrastructures, J. Phys.: Conf. Ser. 331 052025, 2011
[7] ITCM – IT Computer Management - http://service-it-remedy.web.cern.ch/service-it-remedy/ITCM/ITCM.html