

Migration of the CERN IT Data Centre Support System to ServiceNow

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Abstract. The large potential and flexibility of the ServiceNow infrastructure based on “best practises” methods is allowing the migration of some of the ticketing systems traditionally used for the monitoring of the servers and services available at the CERN IT Computer Centre. This migration enables the standardization and globalization of the ticketing and control systems implementing a generic system extensible to other departments and users. One of the activities of the Service Management project together with the Computing Facilities group has been the migration of the ITCM structure based on Remedy to ServiceNow within the context of one of the ITIL processes called Event Management. The experience gained during the first months of operation has been instrumental towards the migration to ServiceNow of other service monitoring systems and databases. The usage of this structure is also extended to the service tracking at the Wigner Centre in Budapest.

1. Introduction

On the 15th of February 2011 the Service Management project [1] entered in production at CERN [2]. The major goal of this project is the provision of a comprehensive and coherent service organization across the whole laboratory based on the supply of efficient processes and tools that use Information Technology Infrastructure Library (ITIL) [3] best practices procedures.

After a thorough evaluation of the products available in the market, CERN elected ServiceNow [4] as the tool that would support the full Service Management structure. This tool, widely used by many companies all over the world, has demonstrated a high level of performance, flexibility and reliability allowing the implementation of already existing monitoring systems into ServiceNow profiting from the best practices methods used by the project.



This paper describes the strategy that has been used to implement one of these particular monitoring systems in ServiceNow: the IT Computing Management (ITCM) structure usually managed by Remedy [5] in the past. The workflow used in ServiceNow and the specific facilities explicitly developed for this implementation are described in detail in the following sections. The last section covers the future plans to enlarge this work to the incoming monitoring systems already foreseen at the CERN IT Data Center.

2. Service Management Project at CERN

The Service Management project is based on the commitment of three fundamental structures:

- A single Service Desk currently available 11/5 able to give support to all users at CERN.
- One place to go on the web (Service Portal) that enables the access to the Service Catalogue and allows users to access the service experts via ticket submissions and the knowledge structure associated to the services included in the catalogue. In a first phase of the project, the GS and IT department services were included in the system. Currently HR and Finance department are also joining the project.
- A set of standard processes for all services provided at CERN. In particular the Incident Management and the Request Fulfillment Process based on ITIL best practices are the two main user facing processes implemented in the system.

The Service Desk consists of a team of six persons who are the responsible for the first contact and support to users.

The Service Catalogue is an inventory of all services provided by CERN. From the point of view of the user, there are two relevant elements included in the Service Catalogue:

- Service Element (SE). SEs describe the services available for the users.
- Functional elements (FE). FEs describe the tools, functions or activities that support the SEs. The supporters and experts are declared at the FE level.

There is a large set of ITIL processes already implemented in the system. In particular, the access to the support units is ensured through the Incident Management (handling of all kind of malfunctions, errors and bugs) and the Request Fulfillment Process (handling all Service Requests and demands).

3. ITCM evolution: from Remedy to ServiceNow

The CERN IT department has been using Remedy since April 1999, to run three major ticketing workflows. One of these workflows, ITCM, was used to handle automatically triggered and manually created alarms on the servers in the CERN computer center. ITCM was integrated with the other two Remedy workflows – the Problem Request Management System (PRMS) [6], that orchestrated all the requests and incidents related to IT services and the Hardware Management System (HMS) [6], that tracked the lifecycle of the servers (install, move, rename, retire) and the repair work of the vendors. Figure 1 shows the integration of ITCM with the other Remedy workflows. The successful start-up of ServiceNow as the service management tool at CERN marked the phasing out of PRMS. Around the same time, plans for migration of the Remedy ITCM workflow to ServiceNow started to be considered.

The latter was agreed in 2012 under the following agreement:

- ITCM would be implemented following best practices methodologies defined by ITIL. In particular the implementation should be compliant with the ITIL Event Management process.
- A simple approach would be adopted using already existing implementations. Any specific development and improvement implemented for this migration should be reusable by the rest of the users and supporters in order to ensure a coherent infrastructure for all of them.

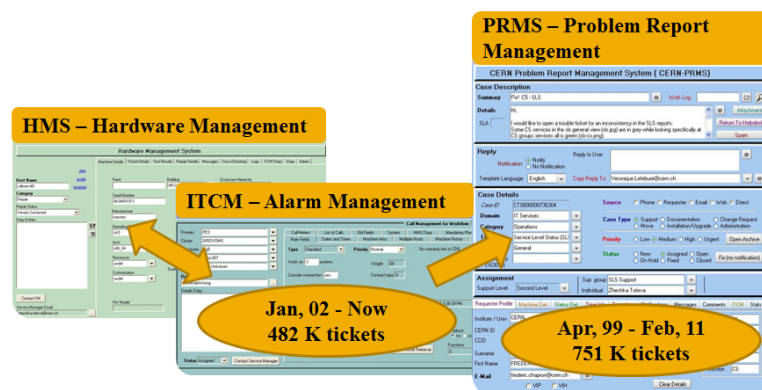


Figure 1: Integration of ITCM with PRMS and HMS

3.1. The Event Management process in ITIL v.3

The Event Management Process provides a mechanism that enables the early detection of incidents. The implementation of this process should allow the detection and the early assignment of these incidents to the appropriate experts before significant damage to the level of service required by the business occurs.

There are three types of events described in ITIL:

1. Regular operations, information events.
2. Indicators of a closer monitoring need, warning events.
3. Exceptions.

In particular, the Event Process infrastructure implemented for ITCM observes the third case only.

4. Implementation of ITCM within ServiceNow

The ITCM implementation in ServiceNow consists on a simple workflow including the creation of incidents for the handlings of the exceptions (henceforward called alarms). In addition, a set of dedicated facilities created ad-hoc for this implementation and distributed to all processes implemented in the system have been developed. Finally, a complete CMDB structure has been created in order to collect the hosts (henceforward called Configuration Items, CIs) registered at the CERN IT Computer Center and that can trigger alarms.

4.1. CMDB in ServiceNow

The Configuration Management DataBase in ServiceNow represents a complex set of Configuration Item objects and the relations between them. The extensions carried out to the CMDB schema in order to accommodate the event management process, have followed two basic rules:

1. Use the maximum possible from the out-of-the-box CI objects
2. Be generic enough in order to be used by other future processes.

The main CI used by ITCM is the server. Servers are grouped in Clusters and are hosted in Racks. Servers have been purchased from a Vendor and currently are maintained under a certain Warranty. A warranty is provided by a Maintainer, often different from the initial Vendor. In particular, this maintainer is the one with whom a ticket for repair work is open, in case of hardware failure.

The CMDB in ServiceNow holds only copy of the data that are collected from different primary data sources at CERN. Namely, the Hardware Database (HWDB) [7] provides the serial number, the warranty number, the vendor and the unique asset tag of the server and the warranty information. As this information is relatively fixed in time, the synchronisation between ServiceNow and HWDB is executed incrementally every morning. The network database, gives information about the physical location of the server, e.g. the building and the rack, the responsible and the main user, the manufacturer of the server and the initial operating system and version. Finally, ServiceNow pulls hourly from the configuration database, formerly the Quattor CDB [8] and lately the PuppetDB, the frequently changed information, like the server cluster and importance. With a recently implemented

enhancement, ServiceNow can initiate a synchronisation run for a single server, in the case when the first alarm arrives for a newly installed machine before any information about it has been synchronised with the ServiceNow CMDB.

4.2. ITCM Workflow in ServiceNow

The ITCM workflow consists in the following steps:

1. *Event detection*: Action triggered outside ServiceNow by the Lemon Alarm System (LAS)[9]. Each alarm triggered by LAS needs a manual acknowledgment by the Computer Center Operators (CC Operators) before being registered in ServiceNow. This operation is performed outside ServiceNow.
2. *Filtering*: No specific filters have been implemented for the moment.
3. *Logging*: Once the alarm has been manually acknowledged, it is recorded in ServiceNow as an Event Record on a one-to-one basis.
4. *Categorization*: The alarm handling has been implemented through the Incident Process. The registration of every event automatically creates an incident (henceforward called master incident) that will be assigned to a specific support unit for further handling and resolution. On a manual basis and being a conscious operation, associated vendor ticket can be created to distribute actions to external contractors.
5. *Closure*: The resolution of the master incident will directly close the associated event.

4.3. The event record, the master incident and the vendor tickets

After the manual acknowledge of every LAS alarm an event record is created in ServiceNow. This event record includes significant information provided by LAS such as the list of CI(s) and the associated alerts, the reaction time (e.g. space of time between the automatic registration of the alarm in LAS and its manual acknowledgment by the CC operators) and the FE, (representing the assignment group that in a first instance will handle the ticket. Two assignments groups are foreseen by the system: CC operators and sys admins)

Each event highlights an alarm associated to a single or to multiple CIs and alerts; the single CI/alert event being the most frequent case (about 95% of the alarms contain a single CI). Each alarm has to be evaluated and treated by the corresponding experts and support units. In order to ensure a coherent approach with the already existing implementation in ServiceNow every event registered in the system and describing an alarm triggers a master incident in a one-to-one basis. With this approach the system ensures the correct assignment of the alarms to the appropriate support units.

Master incidents do not have any particular characteristic beyond the common incident process implemented in ServiceNow for the handling of any user incident. The key information in this ticket includes the assignment group (first responsible for the alarm handling and provided by the associated event), relevant information associated to the main CI and the complete list of CIs included in the event.

In numerous cases the support required for the alarms needs to be treated by external companies who provide the support to the specific hosts. In these cases, associated tickets to the master incident can be opened and assigned to these external companies. These associated incidents are called vendor calls or vendor incidents. These vendor incidents contain relevant information that the contractor needs for the successful resolution of the incident.

Once a master incident is acknowledged in ServiceNow by one of the support members, this person can proceed with its resolution or with the escalation of the ticket to other support units, depending on the problem described in the ticket. This person can also require the confirmation of those responsible for the host before any action is taken on the CI. A facility has been implemented in the system to involve these persons, who are included in the record associated with the CI in the system. If the master incident responsible requires the creation of associated vendor tickets a simple selection of the CIs included in the system allows the creation of the vendor incidents. Such vendor tickets are

automatically assigned to the proper company and contain the relevant information required for the successful resolution. Information about the companies associated with each CI has been previously recorded in the system at CI registration time. In addition, the responsible of the master incident can follow the vendor ticket evolution and can eventually reopen the ticket in case of an unsatisfactory solution. Only when the vendor ticket has been successfully resolved, the master incident responsible can proceed with the resolution of the ticket. The CI responsible(s) can also reopen the master incident.

No interference between the CI responsible and the external companies is allowed by the system. In addition, the visibility of vendor tickets between different companies or the access to master incidents or any other ticket submitted to ServiceNow by the external vendors is suppressed.

4.4. Creation of events on a manual basis

A specific form (based on the out-of-the-box ServiceNow Record Producers) has been implemented in the system in order to allow the creation of events on a manual basis, in addition to the automated alarms creation triggered by LAS. This facility is only available to well defined experts who can report unmonitored oddities on their CIs, and will have their tickets treated in a similar way to the automated ones.

4.5. Additional improvements and facilities implemented

The migration of ITCM to ServiceNow requested the implementation of an important set of new facilities that have been reused and generalized for the whole system. The most important implementations are the following:

4.5.1. Bulk operations

On average supporters need to handle around 100 incidents per day. In order to optimize the handling of these tickets several bulk operations have been implemented in the system and enabled for all support lines besides ITCM. These bulk operations apply to the master incidents only. The most significant bulk operations include:

- Assignment to the logged in person: this action allows the user to assign the selected set of master incidents to himself.
- Reassignment to the pool: reassignment to the full support unit.
- Add internal and caller communications: the facility allows the addition of the same messages accessible for other supporters (internal communications) or for the caller (caller communications) for a set of tickets previously preselected.
- Add contact persons in the watchlist: selection of the CIs responsible(s) to a selected set of tickets. The information is taken from CMDB.
- Resolution of tickets with the same solution

4.5.2. Implementation of Underpinning Contracts

The description of the so called Underpinning Contracts (UP) is included in the Service Level Management (SLM) context defined by ITIL best practices. The goal of this process is to ensure that the agreed level of service is provided. For this aim SLM negotiates, agrees and documents service targets to be provided by service providers and by external contractors.

External contractors are handled by Underpinning Contracts following ITIL best practices. Based on the contractual intervention and resolution time signed with each contractor and available for each CI included in CMDB, standard UPs have been created for all contracts. These standard UPs establish traceable temporal targets for the resolution and the intervention time per each vendor ticket.

In addition, the ITCM responsible team requested the automatic pause of the UPs depending on the external load. A new field was defined at the UP level enabling the definition of a threshold, over which the incoming UPs for new tickets are paused.

4.5.3. *Piquet calls*

Under certain circumstances, usually associated to the importance of the CI, CERN personnel can be contacted via phone outside working hours. In order to track these calls, a piquet call facility was implemented in the system at the master incident level. Piquet calls are recorded in the system including the phone number, time of the call and an issue description.

4.5.4. *Calendars*

The existing infrastructures available at the CERN IT Data Center to declare the availability of the supporters have been replaced by a new calendar facility available in ServiceNow. Both best effort and piquet calendars can be defined specifically for each FE giving therefore the possibility to define different calendars per person depending on the service that has to be covered inside and also outside working hours. The calendars are accessible both from the incident and request ticket and from the FEs.

5. Results and future plans

The new ITCM implementation in ServiceNow entered in production on the 25th of February 2013. A continuous improvement approach has been applied since that date in order to implement new facilities (e.g., improvements in the bulk operations and in the calendars) and to adjust those already existing (e.g., the reporting infrastructure). 22080 ITCM related tickets have been recorded in the system in the first seven months of operation, becoming the major source of incidents recorded in ServiceNow (35% of the incidents submitted to the system). Both the system and the supporters have been able to cope with the amount of tickets. The resilience of the system is currently provided by the LAS monitoring infrastructure that keeps all tickets in case of a temporal interruption of ServiceNow. CERN IT Data Center is currently under a major restructuration using a new Data Base environment introduced in 4.1. and a generic alarm reporting system called Generic Notification Infrastructure (GNI) able to provide a generic and common interface to different service monitoring systems. In the following months the structure provided for ITCM will evolve to include the new generic system. With the current CMDB package, ServiceNow has already registered all CIs available at Wigner Center in Budapest. Alarms associated to these CIs will be also handled by ServiceNow as soon as the center becomes fully operational.

References

- [1] Service Management Homepage: <http://services.web.cern.ch>
- [2] <http://www.cern.ch>
- [3] <http://www.iti1-officialsite.com>
- [4] <http://servicenow.com>
- [5] <http://service-it-remedy.web.cern.ch/service-it-remedy/ITCM/ITCM.html>
- [6] <http://service-it-remedy.web.cern.ch/service-it-remedy/>
- [7] <http://agilecat.web.cern.ch/data-store/hwdb>
- [8] <http://quattor.org>
- [9] <http://lemon.web.cern.ch/>