Development of a generic IT service catalog as pre-arrangement for Service Level Agreements

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Abstract. Generally speaking, information usually just gains significance only when it is being processed in the context of own experience and being linked to other information. This article describes the development of a generic model for an IT service catalog which could for instance be adapted and utilized by an IT provider in the field of a service management project. The design is component based on a new hierarchical approach. The specification of the IT services by this approach allows instant classification of who should handle the activity and how it should handled. The atomic structure affords the representation of functional dependence. Moreover the hierarchical design makes the relationships between different components more clear. Additionally there is a discussion of the terms IT service and IT business process, a dual matrix for both quality of service (QoS) parameters will be introduced.

1 Introduction

The first step when planning a Service Level Agreement (SLA) is the development of an IT service catalog according to [4]. An IT service catalog shall describe the basic and additional services from the customer’s point of view as well as their conditions. On the one hand it is necessary as a means of communications and on the other hand prepares the ground for a future SLA.

Customer orientation is one of the main strategies for IT service providers in the information age [6]. The integration of processes and information systems helps to avoid the disruption in media in the communication between companies and provides information in realtime. IT service customers profit from the shorter response time, services more specific to the problems, multi-channel customer profiles et cetera. Furthermore more efficient ways in planning in various stages with more transparent information provide advantages.

A major part of an IT service catalog is the repository in which the results of planning, realisation and the use of IT services can be stored in a logical structure and are ready for future usage. The IT service catalog as described in this document contains statements on software, hardware and roles relevant to IT service processes. From the IT service catalog the IT portfolio of the provider can be extracted on a low level of abstraction.

The IT service catalog therefore is a proposal for a system to maintain and administer IT business processes and IT services.
2 Discussion: IT business process and IT service

As with many basic terms in computer science there is not the one and only precise definition for IT business processes and IT services which is generally accepted. Rather they are used in daily business in several different shades of meaning. Upon comparing textbooks one will indeed find different "definitions".

An IT service is a complete system fulfilling a specific request. This definition does not give any information on

- who has to carry out the request, either an average user, expert, organisation or computer system.
- which resources or steps for instance the instructions and agreements the request in question are used to describe the request in general.

An IT service can bear a great variety of functions which don’t affect and influence each other. It represents the functions needed by the customer and offered by the provider. The IT service is the intention of cooperation between customer and provider. An IT service is supplied in a certain quality. IT services are maintained by experts and amended to the state of the art in science and always comply with the latest legislation. IT services therefore are adjustable. Upon using an IT service the user must be in the position to state which modifications have to be carried out. The consequence is that an IT service can offer several varieties of his special task which have to be at least partially addressed via different interfaces.

Fig. 1 show a IT service partition tree. There are three different levels in the graph. The first level characterized the area of the IT service. The second level should cover further details. For example the system component is divided in application, middleware (i.e. CORBA, ODBC etc.) and basic services (i.e. DNS services etc.) The atomic component in the graph is the service primitive.

![Service partition tree](image-url)
The quality of the IT service used is represented in the term Quality of Service (QoS). In addition to the ratios for quality itself this also bears the ratio for utilization of capacity [2].

A suggestion is to define the ratios for QoS in dynamic and static figures. Static ratios represent fixed figures such as the providing of a VPN connection or the configuration of a firewall chain; the IT service provider offers his customer specific configurations. Dynamic ratios on the other hand mark running the IT service - for instance the availability of a server or the response time of a transaction. To be reliable those dynamic ratios have to be taken at regular intervals. For controlling the static ratios it is sufficient to adhere to the security guidelines.

The term IT business process refers basically to providing labour which is not the production of goods. A IT business process can not be stored or transferred and therefore is unlike goods. Creation and usage are consecutive actions - an IT business process can not be established without the cooperation of the customer. Therefore an important precondition for service quality to consider the customer’s needs and wants. Service quality IT business processes can generally mean:

- Reliability, reliably and correctly supplying the service as agreed on;
- Security, by competence and politeness of the staff and its ability to appear trustworthy;
- Care, depending on the level of involvement and personal concern;
- Initiative, as result of the readiness to help customers and serve them immediately;
- Physical appearance, such as furnishing equipment and the appearance of staff;
- Competence, to be competent to render the service professionally.

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**Fig. 2. Classification of ratios for IT services**
In formal terms, the dimension of IT business process is human energy per time unit. For planning, realising and adoption of an IT service the IT business process is directly linked to the IT service. This means that the usage of an IT service is only possible by using an IT business process. Fig. 2 show a possible joint classification of service quality for both variables. The horizontal scaling is in static and dynamic ratios.

3 Developing an IT service catalog

3.1 Characteristics of an IT service catalog

An IT service catalog shall enable to rapidly find offered IT services of an IT service provider. The IT service catalog should be flexible. Searched IT processes not specified in the IT service catalog shall be added after planning and adopting of the IT process. The data contained in the IT service catalog shall enable the IT service provider to specify an IT service demanded by a future customer of an IT service together with the prospective buyer. The following characteristics define an IT service catalog:

- a systemic index,
- a dynamic system,
- a structured list of all the existing IT services,
- contains services (parts, components etc.),
- contains service details,
- has a type (internal view/external view).

What marks an IT business process?

- IT process No.,
- service quality (QoS),
- price,
- keywords,
- information on classification,
- information on dependencies,
- an unlimited number of keywords.

3.2 Modelling

An information model for IT services should capture the common characteristics of different work products. The information model should express the common characteristics relevant to process definition. Furthermore it will minimize redundancy by capturing common characteristics in a single place. This capability improves comprehension and reduces the risk of misconception.

The basic structure of the introduced logical data model of the IT service catalog consists of four layers and a wrapper: (1) Customer Cumulative Layer;
(2) Application Component Layer; (3) System Component Layer; (4) Communication Component Layer; (5) Infrastructure Wrapper. The first layer contains information on the individual service concatenations, i.e. the "construction plan" for the Catalog and on the type of IT service. In this layer there also is the correlation of the quality ratios used. The other layers are based on this first one in a hierarchical matter. The ACL contains application processes, the SCL the system and add-on processes and the CCL contains communication processes.

The Infrastructure Wrapper is around the three inner layers. Fig. 3 shows this in a corresponding context.

![Service layer model of IT service catalog](image)

The data model of the IT service catalog generally distinguishes between objects and addresses. Objects and addresses are linked to one Catalog. It is possible to store several Catalogues in a database.

The objects are being put in relation hierarchically underneath each other but also with cross-references. As the relations normally are bidirectional they are described separated from the objects. A similar procedure is used for the hierarchical structure of the address relations. Each object may be referred to by as many addresses via relations as needed. An address as reference is a mandatory field in the IT service catalog.

The IT service catalog has a class model defining different relations for diverse kinds of data. One of the special characteristics is the class IT service with process references to be defined individually. The class General defines the basics and the environment, this class is among others a compulsory field of the IT service catalog (identification and date of initial acquisition, identification and date of last amendment etc.).
Fig. 4 shows the abstract UML model of the IT service catalog. Another significant part of the description is the individual process objects (class description). This class stands for the actual specification of the IT process. Specified requirements shall be comprehensive to all participants and to all the affected. The heterogeneity of all people involved in the entire IT process and the different tasks require different languages adjusted to person and task with individual grades of formalization and methods of description.

For describing of IT processes a method for formal specification of IT processes (which IT process shall be adopted?) and a procedure model for implementing the IT process in an existing IT organisation unit are being established in a doctoral dissertation.

An IT service catalog object consists of elements which describe the individual categories of the IT service catalog mainly also showing the individual "index cards". The elements general, relation to the subject, relation to location, relation to time, additional information and keywordification are used to distinguish objects.

The class ProvisionOfService provides the service (information, controlling, planning, projecting, installing etc.) which is being rendered by the class Customer.

3.3 Structure

The structuring is the most important part about standardised Catalogs. Perfect results as an ideal order can only be achieved when the finished IT products are being presented in a supreme way and when the IT customer as well as the IT
service provider can both identify with this structure. The potential customer of an IT service has very specified needs, such as:

- ...to the system and networks security,
- ...to administrative framework,
- ...to data security,
- ...to service quality,
- ...etc.

A potential customer could search the IT service catalog in a certain level of abstraction, he has access to for these examples of possible demands.

Offering IT processes must be orientated on the needs of the users. The IT service provider requires information on his customer or potential customer. Customers will only decide pro an individual IT process if the IT process has an individual benefit for the customer, that means the price, quality and benefit ("magical triangle") must be in the ideal relation to each other. To distinguish this general model it can be related to products, processes, departments and whole companies. Specified as the service provider offered with a guaranteed feature the model becomes specific to the price, functionality and delivery period.

Fig. 5 shows a possible result of a developed programme.

<table>
<thead>
<tr>
<th>No.</th>
<th>IT-Service</th>
<th>Service-Description</th>
<th>Requirement Specification</th>
<th>QoS ratio</th>
<th>Service Level</th>
<th>Primitives</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>WEB-Server</td>
<td>Dedicated Server Hosting provided with full access to a server in our datacenter via remote administration software. The customer can contigute his operating system and software.</td>
<td>Technical Specification Tier: WEB-Service issued: 01/01/2006 By: Dec. No. 123456789</td>
<td>Dynamic Response Time: 1h - 4h Resolution Time: 4h - 12h</td>
<td>Scheduled</td>
<td>C41, C42, C51, C52</td>
<td>Administrator Phone: -------- E-Mail: --------</td>
</tr>
</tbody>
</table>

Fig. 5. Extract of an IT service catalog

### 3.4 Implementation of reference

Fig. 6 gives a brief outline of the system architecture. The client layer consists of a Java GUI, the input is carried out using the service catalog editor. The middle layer contains the presentation and user layer. A MySQL database is used for data warehousing. Using the native Java driver, MySQL Connector/J, JDBC queries (Java database connection) are transformed into networks protocols of the MySQL database. MySQL Connector/J is a JDBC driver of type IV and includes a complete JDBC function set supporting the performance of MySQL.
The service catalog application provides all components of the IT service catalog. Therefore the user is granted the chance to fill in and modify catalog elements and can freely set the defining values of the elements. The user can enter attributes specified to the process using a mask. This includes for example the type of process (system, communication, application, support), the process predicate and preconditions for fulfilling the process. Fig. 7 shows the service catalog editor mask.

3.5 Summary and outlook

The significance and the foundation for the developed IT service catalogs can be divided into the following individual steps: a) Motivation: IT infrastructures "grew" and were further developed during the years. An overview of existing IT business processes or IT services is virtually only latent available, many processes are carried out redundantly. An IT service catalog structures IT services based on the components. Additionally the implementation of new solutions would
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lead to much shorter period of time for implementation. A further advantage is that different levels can be selected. IT services should be defined in a formal statement and communicated so that managers, developers, administrators and customers understand their responsibilities; b) Approach for modelling the task structure: Modelling was carried out related to objects in UML Notation. The formal funding of UML and the rules in semantics are on the one hand state of the art and on the other hand stronger than for instance business process models related to results; c) Implementation: The realization of the programming work was carried out in Java. MySQL is used as RDBMS; d) What is an IT service catalog? Which objects make an IT service catalog and how are the dependencies? What are the advantages?: Definition of terms, dependencies of internal components. The introduced prototype model is based on UML. The design is component based on a new hierarchical approach. An IT service catalog as it can be used for instance in a computer center. The specification of the IT services by this approach allows instant classification of who should handle the activity and how it should handled. The atomic structure affords the representation of functional dependencies. The hierarchical design makes the relationships between different components more clear. Furthermore the approach of a repository for IT services is being introduced which uses an universal user interface to further process data. Further projects on this topic could be the connection to neighboring SLM tools such as an interface to a monitoring or trouble ticket system. After entering data in a qualitative way, further tools could be developed, such as a consistency control.

References

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