Hyper system: A Model for Communication System

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Abstract: The distributed applications are organized around a permanent and collaborated communication in order to execute tasks. We target the conception of a hyper-system, which allows a communication between different computer systems of the organism. The engineering of models offers perspectives, which are susceptible to solve interoperability of distributed applications. It allows to be positioned to a higher level of abstraction that allows managing the complexity inherited from these applications. The presented model is based on the hyperisation concepts. The objective is a hyper-system allowing navigation between all components, which is a communication system. The tasks are executed through communication networks composed of modules of different information systems/applications. An architecture separating the tasks, the communication networks, and the communication entities, assures a degree of a very high adaptability also coherence and integrity. This paper is oriented modeling.

Keys-words: hyperisation, hyper system, granularity, cooperation, navigator, reuse, module

1 Introduction

Yesterday, enterprises/organisms were efficient when they possess knowledge and produce it in masse. Today, they are efficient when they are creative and reactive. They should offer communication tools and a fast access to information. The following notions appear: zero delay, freshness of information, and distance works [1]. The enterprise is passed during twenty years from an architecture strongly centralized to another distributed [2]. Thus, traditionally the users of these applications belong to an organism/enterprise collaborating by grafting external solutions like file transfer, mails, and even re-entry of information. The necessity of integrating the information systems/applications in a global information system is crucial. This must be coherent, reliable and follows the evolution of the organism [1]. The work is motivated by the big expansion of distributed systems and the elimination of barriers for the organisms and enterprises. The development of services on the web and small web increase. Today all is shared, and virtual organism is in expansion. These decrease the cost of work and reduce execution time of the tasks. It also optimizes the useful of competence and resources (hardware and software). This work is at the intersection of several domains and necessitates a cooperation of several disciplines. The conception of a communication system in an organism is very complex. It is involved in the majority of cases after the development of several IS/[1]applications in the different services, which are composing the enterprise. Different services have to execute local and extern tasks. The communication system takes in charge the extern tasks that it assures their execution implying a sub-set of IS/applications existing in services. The communication system follows rules of management imposed by the organism and it executes the tasks defined by the managers. Communication is based on messages, data and/or events. It depends on the type of task, the kind of the organism and others features dressed in the first step of de

[1] IS: Information system (it is considered in all paper)

design. We focus on the conception of hyper-system which allows a communication among IS's organism exist. The model is based on the concepts hyperisation. Moreover, it consists to apply the techniques hyperisation of a linear document. The result is a hyper system allowing navigation among all components, which is the communication system. In this article, an introduction has the problematic and the idea to develop. The second section gives briefly a state of the art. The third section exposes the model of a hyper system and we present an example. The Forth section presents the architecture of a communication system, which consolidates the model. The fifth section presents a conclusion.

2 The state of the art

The communication systems have a number studies and methods for its design. The literature is rich in matter of works because the communication aspect is very important. We present here some of these works. There are collaboration systems [3], mediation systems [4], wrapper systems [4], and notion of view applications [5]. The common point, which is observed on works met and studied, is the following: the communication is centered on the exploring of knowledge and data in all their diversity through a meta-model. It exists models with components for multimedia systems also containers and middleware like CORBA [12], CCM [13], EJB [14], **.**NET which are platforms showing limits of flexibility and adaptability for specific needs. It exists others tools and plat-forms like CHOOE [17] based on communicant processes and services and SIRAC [18] project, which propose OLAN model based on re-use of part of code and/or all code of application. It also proposes an architecture CoopScan [19] based on local and/or distant interconnected modules.

3 The conceptual model

Our interest is to make the collaboration of existing applications. We dress an analogy between hyper document and hyper system [20] and present an example. A hyper document is composed by introduction, a set of chapters and conclusion. A set of chapters is composed by chapter1, chapter2, … and chapter n. One or many sections compose each of them (see figure 1).

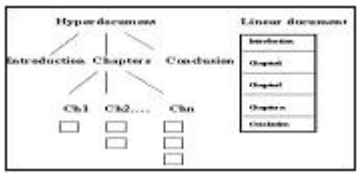

Fig.1 Structure of Hyperdocument

An hypersystem is composed by description like name of organism/enterprise, version number, date, authors, purpose… It is composed by many information systems or applications (IS1, IS2, ISn). Each one or all are composed by a set of modules associated to icon in menu (see figure 2)

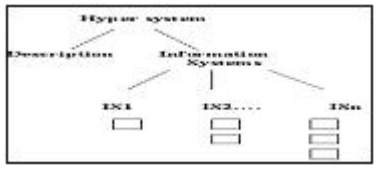

Fig.2 Structure of hypersystem

3.1 The analogy of a hyper-document and CS/applications

Hypersystem structure is:

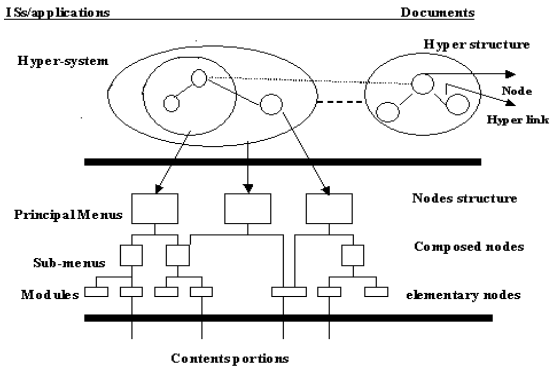

Fig.3 The hyper system structure

3.2 The model

The engineering of models offers perspectives susceptible to solve the interoperability of applications. It allows taking a position at

higher level of abstraction, which allows managing the complexity inherent of these applications. The construction of an application passes by the elaboration of models which are then applied operations to arrive at production of code [3]. The principle is to design a hypersystem, which authorizes navigation among different information systems/applications. Thus it allows communication. This communication is based on the execution of a task that integrates a set of software entities belonging to one or several existing information system/applications. The model that we present here is the model of hyper-documents applied to a set of applications.

This set is modeled as non-linear document and forms a hyper-system (see figure1). We have chosen the concepts of hypertext and hypermedia because it is very strong in point of view flexibility, which is offered for the constitution and the navigation (consultation) of a documentary base [6]. The hyperisation, which experiences a document electronic, is applied to a set of IS/applications. The links are referential and structural. The obtained structure (web) represents the global application of the enterprise/organisme which is not in reality other than the communcation system (hypersystem). The level of granularity is fixed by the processess of hyperisation [8]. It is fixed in our model to module associated to an icon of the menu. With this model ISs/applications are decomposed into sofware entities or modules. They represent communicant entities. We propose a re-definition of applications in term of modules (software entities) or communicant entities [6]. The genearted entities are involved in the execution of tasks and constitute a networkofcooperation(communication). In our case the module can be involved in the execution of several tasks. Furthermore, the physical aspect of networks is negligeable in our investigation. The interest of using the concept of hyper-document resides in facilities of consultation and, to level model in the construction easily by external views on portions of the contents. It allows versioning of applications. Thus, a same portion of content can be shared among several nodes and reached by different point of views [6]. The model allows a high level of genericity in term of adding a new application in correlation with the evolution of the organism. Table 1 summary the main characteristics of hyper document, which hypersystem benefits of them.

Motivations for hyperisation	Versionning	Strong structure	Semantic integrity	Search engine
Hyper document	X	X	X	X
Hypersystem	X	X	X	X

Table 1 Interest of hyperisation

3.3 The methodology

The method is entirely based on the communication. It germs the elements of the cooperation which will be exchanged among modules of systems/applications involved in the execution of a task. The steps to follow are: 1- to estimate the number of the existing IS/applications in the organism (distributed or not). 2-To classifies modules and information, which produce and/or consume. 3-To determine the entities /modules which cooperate among them in order to execute a task. 3- to dress the interactions matrix for all modules. 4- to draw the web associated to the matrix. 5- to apply the predicate “execution task” to determine all communication networks. 6- to establishes a management of rules in order to assure that the communicating network does not have incompatibles modules and it does not exist communicating network incompatible to application services.

3.4 Example

Let an organism with three applications constituted by nine communicant entities. Figure 4 presents the structure of hyper system after hyperisation. In the first step the interaction matrix is dressed. Figure 6 shows the web associated to the matrix. We see that with just nine communicant entities, it is difficult to be oriented on the graph. So it is harder when the number of communicant entities increases during the live cycle of the applications and organism.

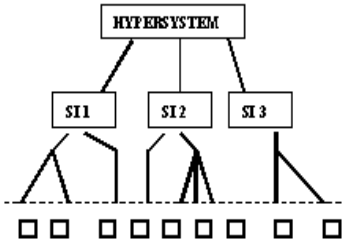

Fig. 4 structure of hyper system

	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8	CE9
CE1	×	x	x		x		x	x	
CE2	x	×	x	x		x	x		x
CE3	x	x	×	x	x				
CE4		x	x	×		x	x	x	
CE5		x	x	x	×				
CE6						×	x	x	x
CE7	x			x	x	x	×		
CE8	x	x		x	x			×	x
CE9	x		x		x	x			×

Fig.5 Interactions matrix

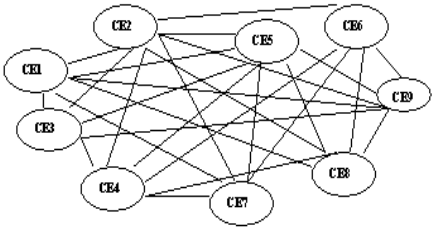

Fig.6 Web associated to interaction matrix

In the second step with the predicate 'execution task'and after dressing all tasks executed by the organism, we have to determine the communication network for each one. One task can have several communication networks.

Entity	CE1	CE2	CE3	CE4
CE1	x	x		
CE2		x	x	
CE3			x	x
CE4				x

Table 2 Interactions matrix for one task

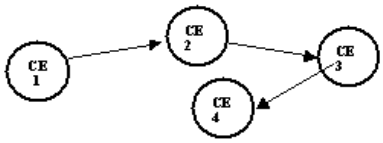

Fig.7 Communication network associated to the interaction matrix

3.5 Advantages

This model allows the integration in the hyper system of information systems/applications, not expected at the beginning. It allows also the aspect of reutilization of existent modules. Several communication networks can share one module. Then there is optimization in execution task. The model doesn't disturb the local and classical work of the enterprise or organism. It support also versioning.

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4 Communication system architecture

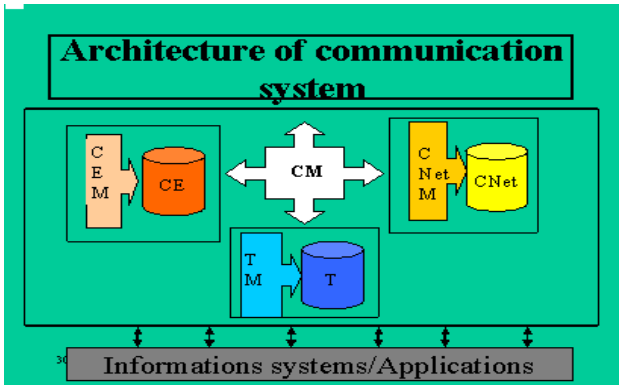

Fig.8 Communication system architecture

To avoid the problem of desorientation (for hyperdocuments, it exist Dexter, Hytime,…)[7] and 'manage the navigation' toward the execution of running tasks on the constructed web, an architecture is proposed. This architecture is composed by three bases, each one has its manager and communication manager which links the three bases and execute selected task. Thus, we have a base of tasks, a base of communicating networks (interactions) and a base of communicant entities.The communication manager constitute a navigator, which execute the invoked task after severals tests.

4.1 The management of communicant entities (MCE)

Its role is to make the update the base of software entities /modules with their attributes like name, application and localization. We have to determine input and output of each entity. The entity communicating realizes activities of communication [15]:

- Transmission and/or reception of information
- Coordination by conceptual objects making in common,- Cooperation by implication in task realized by several other communicant entities,- Re-structuring eventually of knowledge acquired during the run of its communicant activities,- Information requested by other communicant entities. The existence of the MCE is justified because communicant entities have not been designed to work cooperatively with others, but only to exchange information with their immediate environment.

4.2 The management of communication net/cooperation (MCNC)

Its role is to update of the base of network communication. The base is constituted of all interactions that the communicant entity wants to save them [15]. It is constructed by interactions square matrix associated to one task. One task can have many communication networks and then we can apply optimization processes to choice the better one (many parameters are to be defined like time, location, busy resource…). - Reconstitution of cooperative tasks,- Should know the process at any moment- A learning process because emergent knowledge is very useful to improve the tasks.It knows the constitution of the communication network to send information to local but also to distant communicant entity.

4.3 The task management(TM)

Allows us to know what is going on the system [15]. It permits to create new task and delete old and obsolete ones. It permit also to fixe who is allowed to invoke the task and also it define:- Task type, task, sub-task, (subtasks can be sequential or parallel or mixed.)- Communicant entities that are involved in its realization: **conceptual network of cooperation**

4.4 The communication manager (CM)

It is used as demon to assure the coherence and integrity of communications and to make execution of communication/cooperation network correspondent to the task invoked with characteristic recorded in the base of interactions (URL, path, type of application…) of course after all necessary tests. It constitutes the navigator on the communication network (just on the sub-web) designed for the current task on the hyper system. It receives the requests of users and produces the error messages back to the users. It contains two kind of interfaces: one for admonistrator and one for users. The interface's administrator permit to folow the evolution of the organism in sense on new applications, new tasks, olds task, new communication network (to optimise time of execution, …). The users's interface permit users to execute task after checking authentication control, list of tasks attributed to each user. This architecture is a platform. Each site needs to have its own instance. It allows and manages communication between sites when a task is invoked.

5 Conclusion

In this paper, we proposed a model based on the concepts of construction of hyper documents. This model allows a high degree of adaptation of applications used by the enterprise and do not bother the local functioning of different services of enterprise /organism. Thus, there is cooperation (communication) among different applications. The granularity is fixed to module, which is sensed has input and output. It allows the reutilization and versioning of existing modules. Thus, the cost on coding is reduced. It permits also an optimization of execution task. This model would be applied at any enterprise having applications during exploitation and could not support new applications during a development not expected before. A module is invoked in

several tasks: this is used by interaction matrix construction. Model disturbs neither existing application nor their local exploitation. We propose to consolidate the obtained web by an architecture, which will avoid disorientation. It consists to have three bases: task base, software entities base and communication network base. Predicate execution task creates communication network. The model can be used for multimedia applications. The disadvantages of this model are strictly linked to these of hypermedia. We have to develop a prototype. We have to define tools or others methods to demonstrate how really communication is done. Finally this paper is very oriented modeling

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