

Novel Method to Design Integrated Management System for Telecom next Generation Networks

Seyed Mehdi Mousavi
Payame Noor University, Tehran, Iran

Abstract: Telecommunication networks are going toward integration of management systems and different networks of audio, data and video. The main problem is therefore, how could design software to manage telecommunication systems that possess integration ability; means that not to depend to particular technology and could make themselves consistent with different standards and quick changes in application services and in addition reduce complexity of establishment and business process based on business pattern. Present research focuses on resolution of said problem which consequently results reduction in production costs and development of management systems of telecommunication network of next generations. It would be noted that existed method in analysis and design of systems are general ones and not specialized to produce telecommunication management software. In this study, considering previous methods for analysis and designing of systems, particularly RUP Method an especial method presented for analysis and designing of management software to provide a ground for integration of telecommunication systems through development a common pattern for design and considering problems and needs of telecommunication management area.

Key words: Information technology management, integrated management, NGN, system analysis and design, CMUP

INTRODUCTION

To develop a software system, it is first required to analyze and design related system. There is different method to analyze and design of systems that can be used for appropriate application. In field of design and analysis of telecommunication management systems, the methods attract most attention that have some particular features as: it would be able to provide ground for integration of management systems, not to impose a lot of cost to develop and maintenance of systems and there is possibility for re-use of its components, able to make coverage interaction with other telecommunication operators properly and pay attention boundaries points in its design and analysis completely. Meanwhile, it could be able to develop standard models and patterns that would be conceivable to others, who are involve in telecommunication systems and reduce complexity of design and analysis of systems resulting from number of patterns, models, graphs and tables. RUP Method is one of the most commonly used methods in design and analysis of systems that do not meet mentioned requirements. For instance, since this method is based on development of classes and objects for particular components has not poses ability of re-use or re-design of components for other application (Pekka *et al.*,

2002). Therefore, in case of applying RUP Method to design telecommunication service management systems while emergence of new application and services and their quick changes in networks of next generations, re-design of management systems is necessary which impose many costs to systems (Alexander *et al.*, 2005). In addition, development processes of RUP, introduce vast of models and activities that are not appropriate for implementation of commercial patterns which is concern of management systems of next generations, since cause for complexity of systems analysis and can lead properly flow of hierarchical commercial processes. In present study, a new method as CMUP has been introduced that particularly can be used in design and analysis of systems to produce software of telecommunication for next generation and meet the requirements of design and analysis in this field and would be able to remove RUP problems in this arena and provide common language for all who are involve in this area including: hardware manufacturers, software producers and telecommunication service provider. Through development of standard models and patterns, by which related costs to design, development and maintenance will be reduced significantly in next and provide ground for integration different management of telecommunication systems within networks of next generation.

INTRODUCTION TO CMUP METHOD

CMUP (Communication Management Unified Process) Method introduced in this study has been suggested as an especial method to design and analysis of telecommunication management systems for next generation, presented in two parts as: 1st part focuses on producing management elements with re-use ability that so called as constructive blocks and 2nd part emphasizes on production and construction of management systems based on commercial process using produced constructive blocks. Generally, CMUP Method's approach is toward design and modeling of constructive blocks. Constructive blocks could be formed through classification of analytical dependent classes and based on collective information requirements, common objectives or need for close contribution. In contrast with RUP Method, mentioned focus involve with design and modeling of overall system. Distinction of system to constructive blocks in CMUP Method, cause that this method will use lesser graphs and tables and therefore, it poses development processes with lesser volume and as a result more agile than objective oriented design. Meanwhile, introduction of this method in two parts, resulted in reducing complexity in development stages and use different graphs establish relation between them. particularly in implementation of commercial mechanism, and in addition, part 2, developing proper mechanism, cause enhancement in re-use ability of component, by which considering quick changes in application and services in next generation networks, make reducing costs of design of telecommunication management systems. Among other features of CMUP, it could be pointed out to constructive blocks protocol. These protocols, in fact, express characteristics of design of constructive components. Protocol of constructive blocks of one group in fact, specify information and behaviors that could be able to use in commercial processes to support them and some of them could be presented or supported by one constructive block and act more specific than sub-system in RUP Methods. Therefore, to design network management systems based on special commercial processes and quick change of applications and services (market evolution) is desired. This mentioned modeling and express fully features of systems which has been carried out in XML language (Extensible Markup Language), would cause to facilitate re-use of constructive blocks protocol in new application there would not required to design and analysis of thorough system again and required changes impose least costs. Meanwhile, possibility of re-use and implementation of commercial patterns such as eTOM (enhanced Telecom

Operation Map) and its information model SID which is expressed on NGOSS (Next Generation Operation Support System), would be provided. Of course, presented method has not been rely on special standard and information model, therefore, could be used properly which certainly composed from numerous service provided, particularly, using this reference model, causes to clear thoroughly borders between involved organization in establish a service. In following, stages and flow diagram of CMUP have been described. This flow diagrams provided in two distinct parts. each of them is able to perform distinctively. It is worth to note that these flow diagrams are simply able to provide using UML standard language.

Flow diagram of producing of constructive blocks:

- Formation of commercial model is consisting of following items:
 - Plotting of application graphs which specify involving commercial roles and name of application and commercial standards applied such as eTOM, SID, DMTF and TMF
 - Real modeling and identifying required factors to execute specified application including of properties, resources and commercial roles
 - Develop activities graphs specified application
- Development and optimizing of reference architectural which is composed of commercial models, functions and introducing borderline between involving organization
- Analysis of requirements which is consisting of following items:
 - Specifying and modeling of application between requirements and plotting their functional graphs
 - Expressing supplemental specification of non functional of requirements
- Development of analytical models and classes of objects and plotting of the contribution between them
- Categorizing of analytical dependent classes and develops constructive blocks and plotting of the contribution between them
- Modeling of constructive blocks protocol and provide their XML considering following items:
 - Nomination of constructive blocks protocol as text
 - Nomination of border line that supports by constructive blocks protocol
 - Introduction of services which provide by constructive blocks as text (such as SLA and QOS)
 - Application locating and contribution graphs in UML language

- Locating of specification protocol means and marginal information model in UML language
- Introduction of implementation technology of constructive blocks protocol as text (such as Java and net)
- Locating if contribution graph of constructive blocks in UML language

Work flow of re-use of existing constructive blocks: In this part, some procedure introduced by which utilize existing constructive blocks in some application and independently could be execute from part 1. Therefore, it causes enhancement in re-use ability of components and reduction in complexity and expedite design and analysis for new application. The mentioned work flow is consisting of following steps:

- Formation of commercial models and analysis of requirements which causes modeling of application and plotting of their flow diagram
- Information modeling and systematic processes included of control flow, information flow and systematical activities that causes to plot activities graphs, analytical class graphs and contribution graphs between objects
- Re-modeling of systematic processes and mapping to existing constructive blocks protocols that causes to develop a new set of systematic activities graphs and if that activity has been supported by a constructive block protocol, its name should be mentioned
- Modeling of information and objects that have not been mapped to constructive blocks protocols
- Mapping of protocols to constructive blocks and collection of constructive blocks and system examination

Advantages of suggested method; CMUP, against previous methods: At it described, following items has been existed in suggested method which distinct present model from previous ones.

Reduction of design complexity: Design complexity means variety and distribution manufactured production such as tables and graphs which make analysis and inference difficult. In mentioned method, through dividing design works into two distinct section, management of development and application of different production that manufactured in different stages of design and analysis (such as tables and graphs) will be conducted better than previous one. Therefore, the blocking and ordering of design and manufactured production would be more precise, the complexity will be more reduced.

Design orientation based on commercial pattern:

Previous methods for design start with requirements analysis without any framework identify to them. In CMUP Method as it illustrated, analysis activities start with formation of commercial models which make opportunity to implement proposed different standards for network of next generation and that mainly are based on commercial patterns.

Reduction in required time for design: There is work flow based on re-use of previous produced component and since mentioned schema is in form XML, simply we can make changes only in concerned sections. Therefore, there is not required to conduct all design steps from the beginning to the end. This causes to expedite analysis and make orchestration in management software with quick changes of services.

Reduction in design costs: Some costs of design stage is consisting of costs of provision of required software and hardware and payment to human resources, so within mentioned method for the reason of reduction in required time, the cost of human resources will be as well decreased.

Integration of network management and especial attention to border lines:

Within previous methods for design and analysis, to develop soft ware no significant attention have not been paid to transaction with other active software in that area of concern. In mentioned method and considering requirements of telecommunication networks in second stage of design, reference architecture will be formed. To provide proper sight or programmer with respect to situation of border lines and application standards. Hence in case that in design stage, mentioned method has been utilized and if needed, the programmer can make concerned changes through exact recognition of connection point and standards and related protocols and also with prediction that he/she made in coding and make ground to integrate network management.

CASE STUDY: DESIGN AND ANALYSIS OF SLA MANAGEMENT SYSTEM

Present case study is to evaluate propose methods; CMUP and design and analysis of request system and establishment of SLA (Service Level Agreement) will be provided through CMUP. SLA in fact is a protocol for level of services which finalized by client and since, it is required to include commercial patterns consider link with different sub-systems, the design will be

complex. In addition, due to quick changes in services and transferable, level of systems would be subjected to great changes which is required to implement such this consistency in most quick time as possible. According to CMUP Method to reduce complexity of design of management system of SLA, mentioned systems will be divided to constructive blocks. Constructive blocks will be formed after analyzing of requirements and identify the application and plotting activity graphs and formation of analytical classes and its categorization. In present study, 5 blocks have been produced which is consisting of:

- Support of SLA orders
- Orchestration in SLA implementation
- Customers SLA information
- Configuration of service guarantee which is in order
- Control of services for service quality

For instance, one of the constructive blocks which is required in SLA management systems is QOS server control in which related statistic specification will be traced and in case of necessity calculate next values. Also, allow other blocks to access its CIM data banks. To complete design of system it is required to design required constructive blocks separately and coding would be carried out based on contribution graphs between constructive blocks. Therefore, in present study to acknowledge CMUP Method, design of QOS server control will be review through this practice and design of other blocks will be performed in same way. To design and analysis of mentioned block, we, first, based on requirements of telecommunication management systems of next generation and existing commercial models such as eTOM, involved commercial roles and required application to server control block of QOS will be identified. These items in Fig. 1 and through standard language of UML have been illustrated.

In Fig. 1, presentable services within mentioned block have been mentioned at right and users of these services (perhaps other constructive blocks) have been specified on left side. The services which expected from server control of QOS from complex of SLA management systems is including of starting or stopping control of specification QOS which requested by work flow engines or take the QOS specification which carried out and requested by function control block. Then, using applications which specified in Fig. 1, marginal information model which is in fact observable data to other component will be plotted. Plotting of marginal data model in telecommunication networks in which it is required to establish connection between users is very useful. This model is in fact a form of objects and classes

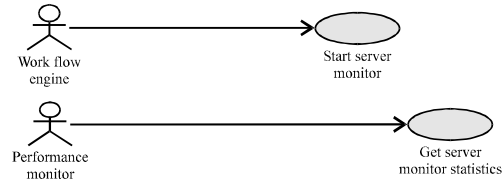


Fig. 1: Application of server control block QOS

that understanding of structure of these classes and their connection between is on high importance. Based on this fact, 5 classes as following could be considered in server control block of QOS:

- Class 1: maintain important information with respect to contact with blocks.
- Class 2: describe block specification
- Class 3: explain manufacturing products by blocks in which it could be apply DMTF standard for format of XML request/response from/to CIM data bank
- Class 4: introduce some parts of codes that could help to statistic calculation
- Class 5: specify starting and stopping method within the block

In Fig. 2, there is format show above mentioned classes through UML standard language symbols. Using this format, structure of classes and relation between those will be more understandable.

After plotting of graphs and required model and selection of technology and concerned standards in this stage using XML format, these specifications will be express as protocol of constructive blocks. This stage is most important section in CMUP Method and can provide a standard format for all who are involve with telecommunication and as well make existing design available with most flexibility, since in case of any changes existed in services or functions, related parts in XML documents will be modified and reviewed and there is no need to design systems thoroughly so, causes great reduction in design expenses. In summary, using CMUP Method in this case study has their own advantages as follows.

Due to the fact that mentioned method use blocking and distinction of SLA management systems to constructive blocks, design stages orderly set out, hence causes for reducing complexity in design and analysis of systems.

Using mentioned method in extraction stage of application, all require processes to manage SLA System is able to implement based on commercial patterns.

As it has illustrated in Fig. 2, using this method causes to consider connection with other blocks of SLA

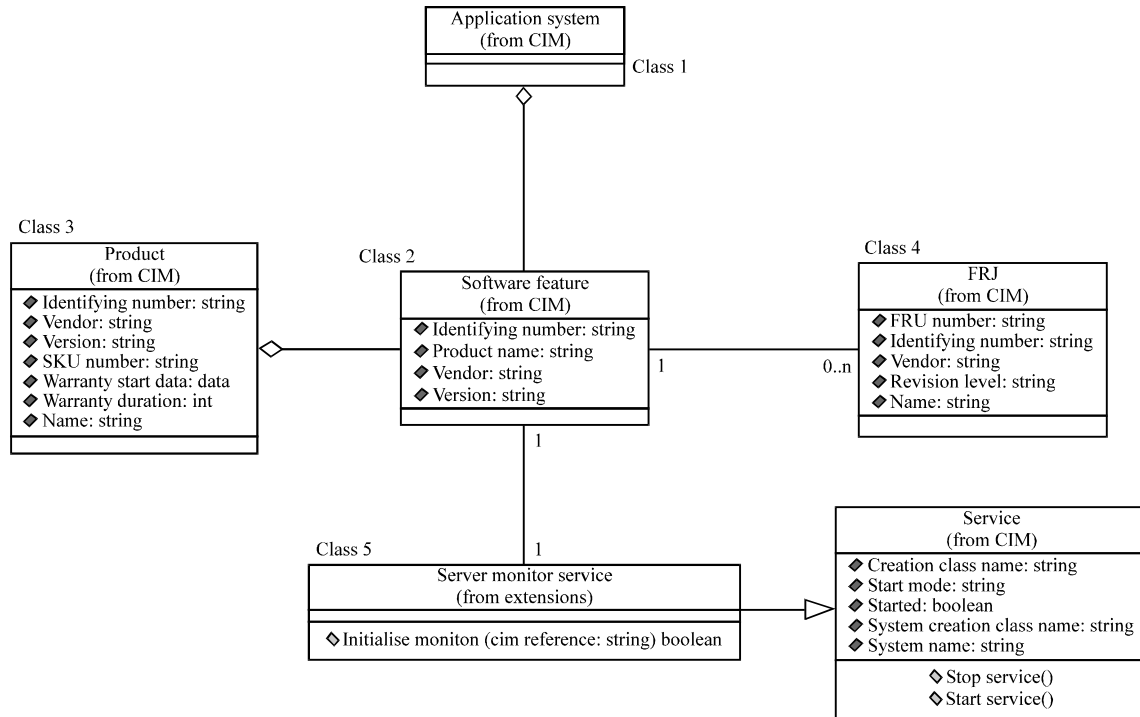


Fig. 2: Border information model in QOS server control block

process such as functional control block in system design thoroughly and for future development, more description will be able to add which could be useful in integration of network management.

Since, requirements of clients in relation with SLA is mostly variables, using format of XML to express of constructive blocks within mentioned block causes to make carried out design coincident with new requirements so it addition to reduction in design time consuming, the cost of payment to human resources will be decreased significantly because there is no need to design thorough system. It could be observed that using the mentioned method with respect to reduction in complexity of analysis and decreasing in time and cost consuming in design, approximately 50% and in regard with commercial pattern utilizing and network management integration, 100% improvement will be find.

CONCLUSION

CMUP Method and its work flow, provide different approach to analysis of systems that cause the mentioned method become as a special method for analysis of telecommunication management systems. Particularly, to design telecommunication management systems for next generation that is mostly service oriented and follows

commercial patterns is mostly appropriate (Chang *et al.*, 2008). The matter has been feasible through focusing of this method on commercial processes and develop constructive blocks protocol through XML format that is a simple and available format to all designers. Particularly, CMUP emphasizes on development of reference architectural and identification of border lines for systems and telecommunication service provider is very useful. Meanwhile, the mentioned method focuses on re-use of previous components and allocation of different work flow to that cause to expedite and enhance in its usability of component. Generally, CMUP Method emphasize on re-use of previous components in new application, could cause significant decrease in design expenses and analysis of telecommunication management systems of next generation which comprises most significant costs of producing of related software (Tudoroiu *et al.*, 2009). Because those could be able to make themselves coincidence with quick changes in market with least expenses. Meanwhile, present method through development of a common and standard language between who are involve with this area of concern to analyze telecommunication management systems and emphasize on re-use of previous components, reduce maintenance, commissioning and development expenses of telecommunication management

systems. In present research, through carrying out a case study in field of design and analysis of SLA management system, using suggested method and comparing with previous methods, it has found that with respect to reducing of complexity of analysis and time consuming by design it has improved to the amount of 50% approximately and in regards with applying commercial patterns and network management integration it has enhanced to the amount of 100% comparing to previous methods. Following to this research, it is possible in addition to both develop its application through automation of design steps based on this method and producing of related software and make its use easier for users.

REFERENCES

- Alexander, C., O. Festor and A. Pras, 2005. Managing new networked worlds: A report on IM 2005. *J. Network Sys. Manage.*, 13: 499-502.
- Chang, B.Y., D.W. Hong and B.D. Chung, 2008. Analysis of network operations management processes. *KNOM Rev.*, 11: 1-11.
- Pekka, A., O. Salo and J. Ronkainen, 2002. Agile software development methods review and analysis. *VTT Technical Res. Center*, 478: 80-100.
- Tudoroiu, R.E., V. Cretu and J. Paquet, 2009. Investigations using the Rational Unified Process (RUP). *Diagrams Software Process Model.*, 4: 523-530.