Dynamic Reconfiguration of Radio Mobile Multimedia Services Platforms of 3rd and 4th Generations

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Abstract

Due to the characteristics of wireless mobile networks (e.g., node mobility, request fluctuation, poor quality of service), operators as well as service and content providers must cooperate to satisfy their customers. One of the solutions is the dynamic reconfiguration of service platforms, which is a real-time operation made on an initial configuration to improve the QoS parameters of the platform. Reconfiguration can be done by software means, and it can be material or logical, meaning that it may affect the physical or software components of the platform, the physical links, or also the transmitted information, without deteriorating the SLAs contracts signed between customers and operators. Several works have been already published in this direction but they fail in presenting a global view and a generic solution for the problem. This work is articulated in the form of a synthesis of the various solutions of reconfiguration which take place with coherence on the various levels of intervention. To this purpose, a model of a platform has been first developed; traffic and mobility models have been also injected to predict the movement and the demand pattern of the users. Moreover, several scenarios of reconfiguration were proposed for the change or the migration of software components, for the management network, the information routing, and the adaptation of the data. In a first part, we address the reconfiguration problem as a mono-objective optimization problem subjected to several constraints. We propose a mathematical model to deal with this situation. However, we found that finding rigorous solutions for this problem may have a huge computational cost. Hence, we also propose an alternative method introducing flow deviation and heuristics in the genetic algorithm. In the second part of our work, we deal with the behavioural aspect of the problem. It consists in considering the different metrics simultaneously and to seek a whole solution configuration representing various interesting compromises between the resources networks and the classes of services and users.

Keywords: *mobiles platforms, services, 3G, 4G, routing, adaptation, reconfiguration*

1. Introduction

Rising generation of telecommunications networks have known increasing evolutions accompanied by data-processing evolutions. This has, among others, motivated the birth of several new platforms and structures of networks which are able to convey new types of traffic such as multi-media, VoIP, mobile television, etc. In these new networks, the users' features changed and are mainly marked by their great mobility, the variation of the required telecom services, by the required flow and the necessary information quality of service. Operators, service and content providers are in the obligation to predict these needs in order to keep up with the development of the customer's request under the best conditions (broad band-width, maximum of flow, minimum delay, etc.), but especially at the best cost. They must then present reconfigurable architectures which can adapt

dynamically and quickly to the changes of profiles, the fluctuation of the request, and the increase in the multi-media traffic.

In such a context, it becomes vital for an operator of telecommunications to offer new services all while maintaining the reliability of its network in order to predict the behavior of the users and to maintain good QoS. The multitude of technologies available, the significant number of levels of inter-connected networks and competition push the operators to seek the least expensive solutions finely answering the various technical constraints. It is thus necessary to choose technologies, to re-examine the routing of the traffic and to dimension the network at lower cost. In a few words, it is a question of optimizing the network, of adapting its structure, of reconfiguring it at the convenient period. It is within this framework of reconfiguration that is this work of thesis which has for main goal the identification of the types of reconfiguration and of the solutions which can be brought to the already operational existing platforms. According to the adopted point of view, reconfiguration can be operated on several levels: hardware, software, and logic according to the site, the type and the nature of the operation of adaptation.

This work is structured in such a way to bring in each of its parts a synthesis either of the techniques before used at the time of work of reconfiguration, or of the models of platforms, mobility and traffic adequate to set up of the processes of reconfiguration, or finally of the algorithms and operations of reconfiguration, the means of setting up them and the solutions which can result from this. Part III is an introduction to the reconfiguration of the services platforms of telecommunications. It thus acts primarily of a work of synthesis of the various data-processing models used for the modeling of these platforms. Part IV is a modelling of the network to be used in the continuation. In the absence of parameters and real solutions, we gave each other a proper configuration with a certain number of users and services in order to see how to develop a model of adequate traffic and mobility in this kind of situations for platforms of radio operator services mobile multi-media. Part IV is the whole of the major contributions of this work, it treats mainly three aspects of reconfiguration:

- material and software reconfiguration: release, realization and results.
- logical reconfiguration according to the change of road: routing within the heart of the network.
- logical reconfiguration according to the nature of information and the profile of the users.

2. State-of-the-art of self-configuration mechanisms in wireless networks

This section presents an overview of the existing self-configuration techniques that have been proposed in the literature to optimize the utilization of network resources according to the requirements expressed by the users' community.

2.1 Telecom Services: Context, Adaptation and Reconfiguration

The evolution of the telecom services is mainly directed towards multi-media data transmission. Indeed, the operators as well as the manufacturers noticed an exponential evolution of the traffic of data. This is why we notice a convergence towards the services development which are based on transport in package mode. Naturally, the idea had just put also telephony on IP. Thus, we attend the creation of a new architecture of communication network: networks of new generations.

With the advent of the third generation, a large variety of services will be proposed not only by operators network but also by services suppliers. In more of these characteristics related to the nature of the mobile environments, the mobile user wants to be able to reach, starting from various points of connection, with personalized services to which it subscribed and which can possibly take into account the localization of the terminal. Thus, the supply and the execution of the services must necessarily take into account the context of the user and his needs to guarantee the respect of the quality of service wished. The problems of the services supply in the future mobile networks were raised by various authorities of standardization. Several work of standardization treated these problems according to various points of view: terminal, network of the operator or services supplier. The directed solutions final (such as MExE, WAP and iMode) are interested in the adaptability of the services to the various mobile terminals. Directed solutions and architectures network (such as CAMEL [3GPP 01-a], SPIRITS [Gurbani et al.. 03] and PINT [Petrack et al.. 00]) is interested in the problems related on the supply and control of the services in heterogeneous networks. Lastly, the directed solutions services supplier (such as DARED [3GPP 01-b] and the Web Services [Kreger 01]) offer interfaces network allowing to the suppliers services to reach the functionalities and the capacities of the network whatever its nature. The report currently raised is the absence of a global vision of these problems. Indeed, the standards and existing work of standardization treat partially the services supply (according to the mobile final point of view, operator network or services provider). Thus, there is not complete solution which meets the needs for all the actors implied in the process of services provider.

2.2 Modeling reconfigurable systems

These last years, of large projections on were made on the following points: increase in the power of the processors, strong reduction in the price of the computers, deployment of fast networks, interconnection of the computers to form Internet. For several years, applicatives architectures have evolved to the world object: the new applications are more and more often conceived by interconnection of possibly existing software modules, which will be in mutual interaction. A standardization of these architectures is in hand. It appears mainly through three major operations: the reference model ODP (Open Distributed Processing) of the ISO-ITU-T, the specifications of CORBA (Common Object Request Broker Structures) of the OMG (Object Management Group) and the third approach are COM (Component Object Model)/DCOM (Distributed Component Object Model) of Microsoft.

2.3 Optimal routing approaches in NGNs

Once the model of the platform has been installed, the models of traffic and mobility injected, we should now address the management of the network resources, deviation of flow, adaptation of information to guarantee best QoS with the users and the best function cost with the operators. A first alternative is possible: translating all these data into a problem of multi-objective operations research. Two large tracks can be continued: a first recourse to heuristic, methods taken of the theory of graph, analysis of network and operations research. The problem can be solved but existing algorithms do not guarantee finding solutions. And a second track based on rather formal mathematical methods which result in a genetic adaptation of algorithm, or of deviation of flow, problems known in the communication and grid systems. The other alternative relates to the behavioural study of the users and sets up a use of methods of coding and filtering to adapt the data to priorities as well of users of applications. In this part, we then seek to

expose the techniques which can be useful to solve a problem of routing of flow of information, a problem which can be differently named by the traditional term: Routing.

The following part then gives a model of the platform on which these algorithms of resolution taken will be integrated of the various techniques mentioned above.

3. Modeling the architecture of the radio-based multimedia service platform

The dynamic reconfiguration of services platforms consists of a passage of an initial configuration to another intermediary while seeking to anticipate and adapt the network to the profile in continual evolution of the users, to the variation of their request and the change of their localization.

3.1 Modeling service platform

On the basis of the proposal in 3 layers already given, we thought that it was necessary to integrate all the speakers in a mobile radio application: since the creation of the contents, while passing by the assembly of information until the offer of the service and its reception by the customer. The complete architecture of an operating platform must then hold account of the whole of these actors. And each operation of reconfiguration will then hold account of the existence of all these parts. We wanted to make platform a model which can be also integrated in the new philosophy of networks known as NGNs: a laminated structure, associating each activity with a layer independent of the others. The model of NGNs architectures is based on the concept of separation of the interfaces of the various layers of the communication network (transport, order and applications), to allow a more important evolutionarity of the network. Taking into account the complexity of the solutions for the telecommunications networks, it is impossible that a supplier is the best in all the fields. With, an opened architecture, which supports the segmentation of the offer, certain industrialists can develop a very pointed expertise and propose offers really innovating. Another advantage of an open architecture: improvement of the cycles of setting new services. In a competing world like that of telecommunications, it is necessary to be able to react very quickly. "open" technologies make it possible to change a component and to put a new service in cycles of a few months (currently, the deadlines are rather of about a year).

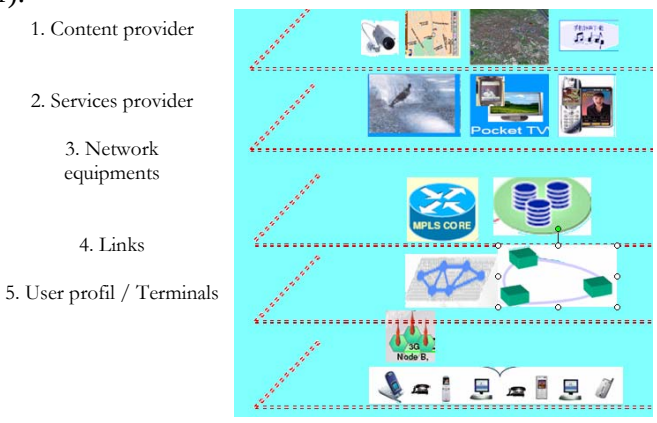

Figure 1. Layered platform architecture.

3.2 Trafic and mobility models

The integration of the data transmission in package mode in the mobile networks radio operator 3G gave rise to the development of various applications within such networks like their interconnection to the external networks. To exploit the privileges of the 3G mobile networks, to provide the resources of transmission necessary for the mobile application, to facilitate the economic use of the radio interface and to take into account the interests of the operators. A configuration for an operator is the whole of the users, their localization, their demand patterns, the position of the equipment (waiters, bases data, bonds, etc), the position of the software components and applications lodged on the waiters, etc. The passage of a configuration with another intervenes continuation:

- with the movement of the users (change of localization)
- with the change of their profile: does the request generally increase or changes
- with the increase in the number of the users according to time
- with the deterioration of the quality of the reception following the congestion of bonds

It is a question of describing services offer scenarios and proposing for each one the corresponding configuration of the network. According to the whole of these scenarios, it will be possible for us to establish the models of mobility of the users and traffic.

We recapitulate here the scenarios of daily mobility of the users and their requirement in term for applications for service:

7 am - 8 am : Departure from residential area to professional area : Voice, News, Meteo

8 am - 12 am and 2 pm -5 pm: Professional area : Voice, Mail

12 am – 2 pm : Lunch break, Voice, Mail, News

5 pm -8 pm : Departure from professional area to residential area : Voice, other

8 pm – 10 pm : Residential area : Voice, News, On line games

10 pm – 7 am : Residential area Voix, Multimedia download

4. Proposed self-configuration models

The dynamic reconfiguration of platforms consists of a passage of an initial configuration to another intermediary while acting on the hardware configuration of the network, the distribution of its software resources or while seeking to optimize the routing of information. This part of work is a panorama of the various techniques which can be applied to an operating platform in order to manage the resources network as well as possible, to guarantee the best flow with the reception and the best response time.

4.1 Material and logicial Reconfiguration

Dynamic reconfiguration poses various problems. One can summarize them by the following points:

- At which moment to make reconfiguration
- on line/off line
- Which type of reconfiguration offer?
- Should the existing code be modified?
- How to as well minimize the costs of reconfiguration on the level of the oncepteur/developpor of the application as to the level disturbance induced on the application?

An operation of material reconfiguration results in addition or withdrawal as well of material equipment of physical connections. It can intervene in the case of activation or reservation of the resources of an operator. We are located if the resources (equipment +liaisons) are available and that according to the request, the operators of mobile telephony or services suppliers can activate, reserve some of these resources and release

them when the need is not expressed any more. With this intention, we simulate four possible cases and each time, we will evaluate the cost of the deployed platform and the flow on the level of a particular customer. We will vary on the one hand architecture (a number of waiters to be put in place or of the connections between the equipment) and on the other hand the number of customers asking for the service. On the other hand, we maintain fixed the parameters of the lines (flow, band-width, time of transmission). The results in term of quality of service are certainly excellent except that they require the operator action and generate a high cost.

4.2. Logic Reconfiguration logique by routing optimization: Experiment Techniques

Work consists in determining an optimal reconfiguration of network, which the total cost of use of the connections of communication minimizes, while respecting a certain number of constraints or specifications, such a problem can be solved by several techniques of optimization of the network to knowing: the graph theory, operations research, the heuristic ones, méta-heuristics, algorithms genetic, networks of neurons [Bonabeau et al.. 99].

The step suggested is based on the maximum algorithm of flow and considers the two following points: maximum flow to transmit with the minimum cost before reaching the congestion. It operates in an iterative way to optimize the network by detecting each time the change of localization or profiles of the users. With each change, the parameters of cost change and the algorithm must then solve the new problems by applying at the second stage another algorithm chosen among those quoted before. The zone of cover being satirized in several under zones with distributed management. On each zone, a node Manager is able to produce the same unfolding of the algorithms presented previously to choose the ways to be used in its zone of cover.

- Does the manager of each zone have an idea on the state of the bonds and knows the traffic of each bond and also the number of jump which information would have to make since the source with the destination?
- For is configuration I, knowing the localization of the users and their requests thanks to the model of traffic and mobility and with the scenarios developed previously, the position of the waiters also known, the maximum algorithm of flow is carried out to determine the adequate way?
- Is the algorithm of minimum flow carried out while considering the parameters of the function cost? Is an algorithm of measurement of load of the bonds periodically carried out in order to ensure itself of nonthe congestion of the bonds?
- When the mobiles move or their behavior changes, the state of the bonds changes and consequently a matrix of incidence can give again and to any iteration the state of these bonds?
- With the detection of a problem, the first stage to be made is to balance flow on another bond. In this context, Branch and Bound can help to find the new bond easily, a list can be extracted and we classify the algorithms according to an order which gives best the function objective?
- The same algorithms already listed for configuration I will be taken again to see whether the bonds of the configuration i+1 reach or not the congestion?
- In certain cases, the problem is not connected to a bond but rather connected to a problem of waiter unable to answer such requests, the problem then amounts finding best the waiter, free, nearest, with an acceptable flow. All can these constraints be solved using a graphic solution to find the solution?
- The first identified solution can not be the best, it will be optimized progressively.

4.3 Logic Reconfiguration by routing optimisation: Formal Techniques

Either a network core defined by four levels representing consecutively, waiters, GGSNs, RNCs and NodeBs, and a matrix of capacity of the various bonds and or a traffic to be conveyed through the nodes of entered of the network towards the existing nodes. It is a question of finding a whole of ways which make it possible to convey in an optimal way the various types of traffic of the nodes source towards the nodes destinations.

Which algorithms to choose ?

Several algorithms one proposed in the literature, in order to solve the problem of optimization. These algorithms have each one a satisfaction degree in execution time and details of implementation. In order to solve authorities of increasing size and difficulty, it is necessary to develop methods increasingly more powerful. To achieve this goal, at least a privileged way develops: the hybridization of methods. In what follows, we present the problem of optimization. Thus, we implement three algorithms by basing us on the technique of hybridization. Being given the network, physical topology and the matrix of the traffic, the problem consists in finding a whole of the ways and allotting values of traffics to be run out on each bond in order to optimize a performance index which respects certain constraints of QoS.

Hybrid resolution algorithm: Djkistra algorithm ameliorated

As these algorithms do not give generic solutions to all the problems of networks, especially when it acts of the resolution of Np-complete models in whole linear programming, we introduced a hybrid algorithm, based theory of graph and operations research. The algorithm proposed can be defined in 4 stages: - Suppression of the bonds which do not have the sufficient band-width, - Checking of the connexity of the graph - Execution of the algorithm of Dijkstra on remaining topology - Update of the Band-width In this part, we will approach the simulation part: the creation of the scenarios in infrastructure mode, simulations of the various parameters from quality of service introduced on the level of the preceding part and interpretation of the results of simulations.

4.4. Logic Reconfiguration by Adaptation and Filtring: Comportemental study

With the development of the applications of telephony (Voice, Image and Video), we attended the birth of new distributed applications multi-media which require very high quality, such is the example of Video-one-Demand or the conference Vidéo, large consumers of resources networks. With the advent of these services applications multi-media, the landscape of the radio operator mobiles knows new needs for band-width and new concepts which are added: profile of users, classes of services, classes of customers.

In this part, we refine even more the routing of information by dealing with the problem of optimization in the multi-media services offer with various requirements for qualities of service of the mobile users. And for this reason, we suppose that the network offers two distinct classes of services to which the users can subscribe themselves: the Super class and the economic class. The subscribers of the Super Class pay much more for their connection but receive a high level quality measured using parameters such as: probability of blocking, the rate of coding, the multi-media format of the services, transfer time from beginning to end, etc. We defined in this level a concept of profile of user, in accordance with 3GPP: 1 These profiles of users help in the filtering of the data flows since the operation would be adapted with the requirements of the customers. 2 the network can admit two classes of customers: Primary education and Economic the 3

customers of the primary class must pay more than those of the economic class but will receive their media with a better quality of service 4 in the case of a congestion, flows of the users of the primary class will be degraded than those of the economic class. the 5 customers of the primary class have priorities higher to be allowed than the network. The filter will act on a whole of flow. Flow passes if the resources of the network available or are filtered if the level of QoS necessary is low. The filter selects the specific level of filtering F for the i^{th} flow of downloaded traffic.

$f = \{0, 1, 2, \ldots, M\}$

where M is the maximum filtering level

0 is the lowest level, meaning no filtering, the customer class is the super-class, the QoS level is sufficiently high or simply that enough network resources are available

We will use the following notations thereafter: - F: data flow - Kth characterizes the flow of exit of the waiter - Characterized by the type of media and downloaded towards the same category of users For the same flow, we spoke about rate of coding R and of format of coding CF of multi-media information, the following triplet gives the characteristic of each flow: [F, R, CF] In order to be able to present the approach of optimization, we will need to fix some parameters:

- various types of media can be stored in waiters media
- for are the filters, all the data similar, the same treatment is made on any package
- the packages of data are initially stored in queues according to their priority: voice, then Video image then
- will flows be conveyed without filtering if the resources of the network are available
- are flows filtered only if the constraints of QoS will not be respected with such a state of the network
- the filters select the rate F of filtering of Kème flow: F = {1, 2..., M}

In order to achieve these goals, we will have needs for a correspondence between the parameters of filtering and the residual band-width available. This correspondence will be done in accordance with the level of coding of information, the source and the type of the operation of filtering. The services deployment in the networks without wire encounters several new problems related to nonavailable of band-width and the heterogeneity of multi-media flow to transmit. These flows require more and more resources networks which are not always available. Several studies show how the methods of coding, the operations of filtering and the operations of filtering with profile of users can help in the maximization of the perceptuelle quantity of flow by using the band-width available on the network. To set up this idea of filtering, we proposed an algorithm the purpose of which is to find at every moment:

- how a great number of users can be allowed in the network since the two classes?
- how to maximize the use of the resources?
- how to choose the level of filtering for each level? Knowing that:
- the customers are been useful without operations of filtering until 95%des capacities of the network is used.
- the routers (or intermediate nodes equipped with filters) decide to reduce quality and to filter flows according to profiles' of the customers.
- the quality of service is firstly degraded for the economic class, the capacities of the network can then accept new users. New users are then allowed in the network: of primary class with priority quite higher
- in the case of arrival of simultaneous requests users of primary class that secondary, the customers of the primary class have a probability higher to be allowed than the network.
- if the bonds are again saturated, flows of the primary users of class are then degraded.

5. Simulation and results

5.1 User Distribution per area and time crenels

Several results can be extracted from the distribution of the users in each time section, the relative maxima and their localizations, the variation during various time crenels etc figure 2 represents the variation of the number of users in the various zones.

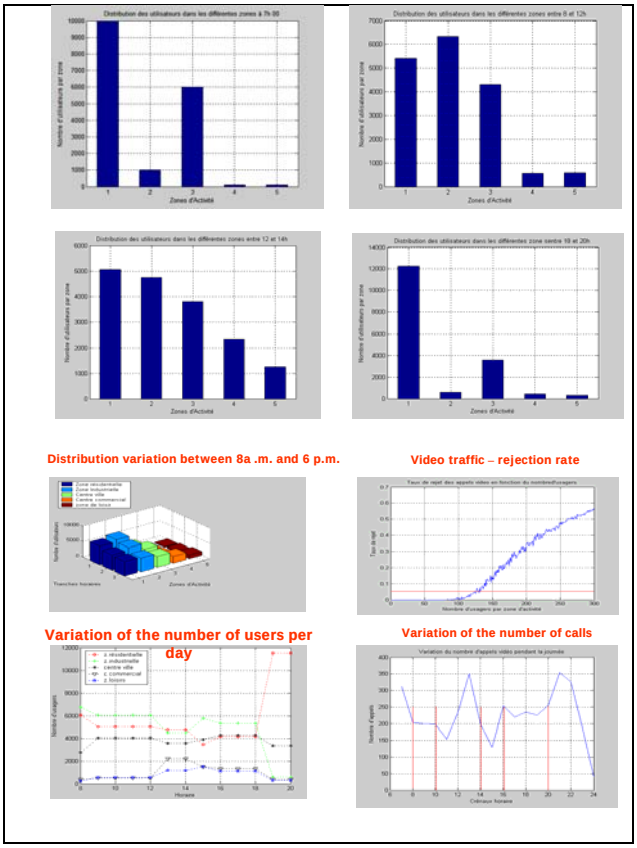

Figure 2. The variation of the number of users in the various zones

From these curves, we can have an idea on the output of the bond in the presence of a number of users as to test his effectiveness by fixing a rate of loss threshold which should not be exceeded, if not we will reconfigure the bond to test it again. With title of example, if the operator then requires a rejection rate which does not exceed 5 %, for a number of users exceeding 120, it will have to increase the number of waiters or to increase the band-width because the threshold is exceeded on the level of this point. It is possible still to improve the study of the zones of activity while proceeding to continue the variation of the number of video calls during one day, in a particular zone. The zone considered will be characterized by the maximum number of users who are there. This parameter can be deduced starting from the mode "Models from mobility".

5.2 Evaluation of empiric technique

We have also to evaluate the performances of the algorithm in the distributed direction, or we sectorized the territory in zone, each one is able to decide ways to borrow but when the nodes edge will enter concerned, it is necessary to find the solution starting

from the Manager of all the platform. We take again here only simulations relating to centralized management.

The algorithm proposed enabled us certainly to identify the best way to transport information from the source to the destination. However the result is not exact and these algorithms used can not be effective on another type of network or certain parameters can change (such as the number of nodes, the number of bonds, the connectivity of the graphs, etc). It is then necessary to find a solution exact which can give a generic result to adopt on any type of network. The goal of the following section is to give tools based on mathematical formalisms in order to differently solve the problem of the logical reconfiguration based over techniques of routing but this formal time Ci.

5.3 Evaluation of formal technique

We simulated the two algorithms and compared their performance in term of: Response time: The response time represents time necessary to convey the information of source to the ilisator through the network.

Rejection rate of the packages: The calculation of the rejection rate is related to response time in the direction or considers of it that any package not reaching its destination before the time limits will be automatically rejected. The rejection rate for the genetic algorithm is very important especially when one increases the number of requests. On the other hand, the MFD has an almost ideal behavior, which shows the second advantage of this algorithm. Utilisation ratio of the ways: A great importance, from operator point of view, is put on the utilisation ratio of the ways. An operator always seeks to minimize the costs of the calls. It is a paramount function in the optimization of network. Therefore, to choose algorithm, it is necessary to hold account of this constraint. The curve below has a presentiment of us the adaptation of the two algorithms to this criterion. The genetic algorithm uses 100 % the ways available in the network, which will be expensive the price level of communication. On the other hand, the MFD saves the resources available east tries not to use all the ways. The genetic algorithm has all the advantages so that it is really implemented or used when the number of nodes is small. But as soon as one increases the number of nodes or requests, it becomes impotent. For this reason, algorithm MFD presents performances much more interesting for wide-area networks. We then schematize these results in the following figure:

5.4 Evaluation of hybrid resolution

To highlight this work, we considered a network into four level, waiters (voice, video and data), GGSN, RNC, and NodeB. Each waiter provided a service towards NodeBs. The waiters are agents UDP, to which we attached sources of traffic CBR of parameters relating to the provided service. The load on the level of the waiters varies according to the behavior of the worn ones. With simulator NS-2 when one uses the protocol Link State (LS) for router the traffics depending on the state of network, one notices that the way already established between a node source (waiter) and a node destination (NodeB) is maintained even if there are other traffics to run out between the same couple (source, destination). One simulated the behavior of the users during one day and one generated important traffic during the peak hours (of 11h with 15h and 17h with 24h).

We took again same architecture and one generated five requests between a waiter and Node B. It was considered that two are of primary education type (voice, video) and three of type economic (voice, video and data). The parameters of the traffics as their categories are described in the preceding table. The stations voice will be been used as t=0s until

t=140s, the video station start to receive their traffic with t=40s until t=160s finally the station of remote loading receives the flow of t=60s until the end of the time of simulation 240s. From the files traces generated for topology we plotted the curves relating to the parameters of quality of service. Figure 3 represents the curve of productive flow without holding account of the guarantee of the quality of service (band-width available, time...) for each considered traffic.

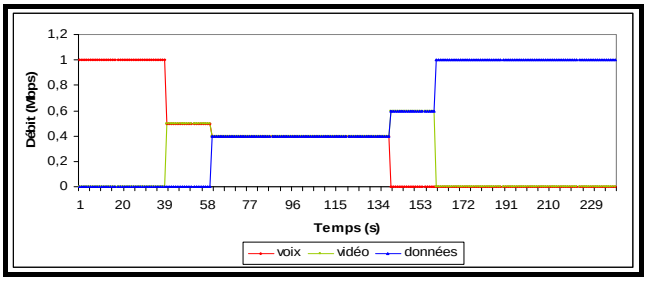

Figure 3. Throughout generated without modification

The analysis of the preceding curve shows well that the routing holds account neither of the quality of service nor the priority of each service. It is noticed well that the band-width is divided between all the traffics which exist in the network what degrades the flow even for the traffics real time (voice, video). Figure 13 confirms well the disadvantages of this type of routing especially when one is in a world where competition becomes increasingly based on the services types offered by the operator and their guarantees. The productive flow of the voice decreases in a remarkable way when the waiter offers a video service, and even thing with a service of remote loading. Thus, the character of not-reliability in this type of routing will be defended more on the level of the other figures to knowing the time and the losses generated on the level of each type of traffic. Thus, the losses generated on the level of the services are almost the same ones on average whereas the service of remote loading does not tolerate a high rate of loss. And the times are very high and do not satisfy the type of traffic real time.

We treated in this part two algorithms MFD and AG adapted to the definite scenario which describes the best way satisfying a function cost (delay). However, they cannot satisfy the needs since they require important computing times and are not highly reliable (several parameters are fixed from the very start). For the genetic algorithm, we noted that the delay decreases with the size of the network whereas the average number of ways used by request increases but conversely for the second algorithm. For that, we presented another algorithm (with the hand) implemented on NS and which had better results especially which it does not depend on the existing number of nodes or of the number of the requests (like the two preceding algorithms). We proposed some improvements of this algorithm, it will make it possible to give better results by holding account of classes of services and classes of users in heterogeneous networks.

5.5 Evaluation of behavioral methods

In order to evaluate the performances of the dynamic management of the resources, let us 10 nodes, of deadlines (10ms for voice, 15 ms for the Video, 40 ms for the data), a band-width of 15Mbps, packages of size 1Ko. In the table which follows, we represented the number of users who could be allowed in the network, before and after filtering for the two classes. For Video flows, with a CF=MPEG and R=128. For example, the bond supports 1 customer of economic class and 20 of primary class without filtering. With filtering, the same bond can support to 120 customers of primary class by always fixing the number of economical customers at 1, or 200 customers of economic class if those of

the primary class are fixed at 20. The result indicates that the number of allowed users increases with filtering.

Table 2. Users number and blocking rate

	Economic	primar
Without filtering	70	2
	1	20
With filtering	1	120
	40	100
	200	20
	240	1

Tableau 2.1 : Users number

Link Capacity	Without filtring	With filtring
65%	20	40
80%	22	80
95%	26	180

Tableau 2.2 : users number

	Arrival call	Economic 20 %	Primar 80%
Sans filtrage	1,1	1	5
	2	24	30
Avec filtrage	1,1	62	50
	2	180	80

Tableau 2.3: blocking rate

We compare here to the use of the band-width available for several possible combinations users asking of video flows with CF=MPEG and R=128. The percentage of the primary education customers and allowed high school customers is maintained in an equitable way (50%). Without filtering, the maximum of the capacity of the bonds quickly awaits saturation with only 26 customers on the whole, however with filtering, the same occupied band-width can be useful until 180 users. Initially, the rate of blocking for the two classes is lower by comparing the figures before and after filtering, then, the rate of blocking of the users of the primary class is higher than that of the economic class before filtering, however it becomes better (inferior) after filtering, as what filtering supports the users of the primary class initially, even if they ask many resources. These first results of simulation show a great interest in an increase in the number of users admitted in the system, while maintaining the parameters of QoS respected and also the definite rates of blocking. We thus thought of using the developed algorithm and y to insert considerations of QoS.

6. Conclusions

The goal of this paper was the proposal and the development for solutions of dynamic reconfiguration of platforms of radio operator services mobile multi-media under constraints of QoS. Dynamic reconfiguration is, in our view, a whole set of procedures which operate on a configuration of the architecture of network to change one or more among its parameters so that the offer of total service in conformity with QoS is required. In this manuscript, we primarily proposed solutions on several levels of interventions. This consists in acting on a layer without neglecting the impact of this operation on the other levels. With this intention, we were brought to: - Initially, to analyze the structures of systems reconfigurable to develop a model of platform containing software components, laminated in independent layers, and which has the capacity to be reconfigured dynamically to support the optimized deployment of the services of telecommunications. - then, to inject models of traffic and mobility to answer the profiles of the users and to adapt to the fluctuation of their requests in a world in clear evolution. - then, better to manage the resources networks and to adapt them to the nature of transmitted information, the wishes of the operators, the requirements of the services suppliers, the limited capacities of the networks. We should have found solutions heuristic to solve this problem. We have for the developed occasion a hybrid approach and a distributed management of the platform to find the best configuration of the offer of service. - thereafter, to model the network in a problem of operations research with a function cost to be optimized (delay) and several constraints which hold in account of the resources networks often limited, and to thus find solutions mathematical for the resolution of this problem. Adaptations of algorithms of shorter way, of deviation of flow

and genetic approach were proposed to solve this problem. At the time of their evaluation, it proved that they are too greedy in response times and that they do not offer solutions optimal for any network, we then were brought to developed a new approach based on the solutions of the theory of graph to solve the system multi-constraints. Finally, to put forward the concept of priorities within the users and classes of traffic for better adapting the resources networks to the already optimized ways. In spite of the various solutions suggested and the variety of the developed approaches, the solution suggested opens the way towards new operations of reconfiguration which will be made side of the invoicing and coding. Indeed, such operations of reconfiguration deteriorate the routing of information from its source towards its destination, or utilize new actors (content providers), or adapt the contents of information to the resources of the operator and the customer. Therefore, it would not be judicious to, apply of all these operations. Thus, we introduce a new paradigm: One stop Billing, it is a new concept, consisting in the manner with which the customer has been useful, of the operations and techniques of adaptation and reconfiguration, of the intervening entities in the offer of service. On another side, our work can lead to other prospects. Various tracks are exploitable. First of all, from an analytical point of view modeling and studies of performances, it seems important to us to extend our analytical models for general operation (mobile network core and nodes). It would be also interesting to implement the mechanisms proposed on an experimental platform and to test their performances by adding mechanisms of safety in order to identify their limitations. Then, in the context of the vertical networks with handovers (i.e., change of very fast technology), it would be interesting to dilute our solutions to support the vertical mobility and the management of multiple interfaces. How to make transparent the changes of equipment (PDA, mobile telephone, desktop PC, etc.)?

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