

Changing the Middleware System for IPTV Services Telecom Operators Based on the Methodology of the Change Management Process

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Abstract – Managing the change plays the most important role in any IT business organization. Managing changes is important for strategic components of the existing IT service. One of such strategic components is the alteration of the Middleware system in the IPTV service of the Telecom Operator. The Middleware system is a central system which controls all other IPTV systems of the Telecom Operator: Video on Demand system, Encrypting system, Headend system, Monitoring system and Database system. That is why, before we uninstall the old and install the new Middleware system we require a set of activities which have to be clearly stated. The reason for swapping the Middleware system can be the common problems and also the inefficiency in the function of the old system. This document describes the steps which need to be implemented in the process of changing the Middleware system in the IPTV system of BH Telecom, the leading Telecom Operator in Bosnia and Herzegovina. The result of the work should be a reflection upon the improvements of the quality parameters of the IPTV system of BH Telecom which are a contribution of the newly implemented Middleware system, which is as a final result going to lead to an increase of users and profit income. This work represents the continuation of the investigation in BH telecom which are conducted with a goal to improve the management over the IT servers.

Keywords-Service Management; ITIL V3; ISO 20000; Change Management; IPTV

I. INTRODUCTION

Today's management of alterations is one of the biggest challenges in the IT industry [1]. Replacement in the IT industry occurs as a result of external needs and problems which have been created in the common operation of the existing IT service [3], [4]. Every successful IT organization has to define how to manage all changes regardless of being operative or strategic. That is why it is needed to define the process of managing all changes (Change Management process) [2].

Various standards of Service Management praxis differently define the Change Management process. ITIL V3 defines Change Management as „ a process which as a

goal has to assure that standardized methods and procedures use for an efficient and quick management of all changes which as a goal has to decrease the impact of incidents linked to the change of service quality“ [2], [3], [4]. ISO 20000 defines Change Management as „ a process which has to assure that all made changes have to be evaluated, confirmed, implemented and reviewed in a controlled way“ [5], [6]. A important thing to emphasize is that the Change Management isn't a process of identifying strategies or IT service designs, but rather the process of implementation of the IT service. Regardless of the standards the key activities of the Change Management process are [1], [2], [3], [4], [5], [6], [9], [11]:

- Controlling and managing the process of changing.
- Recording, evaluating, confirming and rejecting admitted requests.
- Assembling team meetings for the implementation of the change.
- Coordination of the development and implementation of change.
- Evaluation of results made by change and approach to the finalization of change if it has been successfully completed.

Earlier published contributions from this research area are: [7] and [8]. These contributions were written as a part of the implementation of ITIL V3 processes in BH Telecom, the leading Telecom Operator in Bosnia and Herzegovina. The result of the first contribution is a description of the implementation of ITIL V3 Service Design processes in an information system of Telecom Operator, and the result of the second contribution is a percentage of the implementation of ITIL V3 Supplier Management process in IPTV/VoIP system of BH Telecom.

This contribution is connected to Multimedia conference because the paper was submitted under topic: “Multimedia applications” because Middleware system has all IPTV applications for: Live TV, Radio, Internet, Video on

Demand, EPG, TV Mosaic, Interactive chat and Messaging and this document describes the changing of Middleware system (or in other words: Changing Middleware applications). Middleware is the heart of IPTV service, and IPTV service is the main Multimedia system in every Telecom Operator – Today Telecom Operators offer their x-play services (Dual-play, Tripple-play etc.) in the way that IPTV is the central module of some x-play service.

The second chapter explains nine steps which BH Telecom should implement towards the change of the old with a new Middleware system. In the conclusion a list of improvements is presented which should guides us into a new Middleware system of the IPTV service of BH Telecom and also a time table for completing all nine phases [7]. The conclusion also contains a description of the testing process of the change of Middleware system in BH Telecom’s IPTV service which has been done by using test Middleware software versions of some Middleware vendors.

II. ALTERATION OF THE OLD MIDDLEWARE SYSTEM WITH A NEW MIDDLEWARE SYSTEM

Because of the replacement with the old Middleware system with a new Middleware system it is needed to implement the following 10 steps, where an external company is responsible for the realization of the step 4:

1. The specification of the new database has as a goal to define their compatibility with older data bases
2. Define user and administrator lists of specifications which the new Middleware system has to have
3. Criteria for the choice of a external company that is going to design and implement the new Middleware system
4. Defining specifications of the network plan and installation of the new Middleware system by the hand of the external company
5. Implementation of the new Provisioning system towards connecting the new Middleware system with the centre informational system of the Telecom Operator
6. Implementation of the new Billing system
7. Testing the new Middleware system with other IPTV systems
8. Data migration from the old to the new Middleware system
9. Releasing into production the new Middleware system

A. Specification of the new database towards the identification of its compatibility with older database

Figure 1 shows database scheme of the new Middleware system [15]. The number of tables in this database scheme is 20 and main tables are: subscriber, channel, device, vod_contents, program and billingiptv.

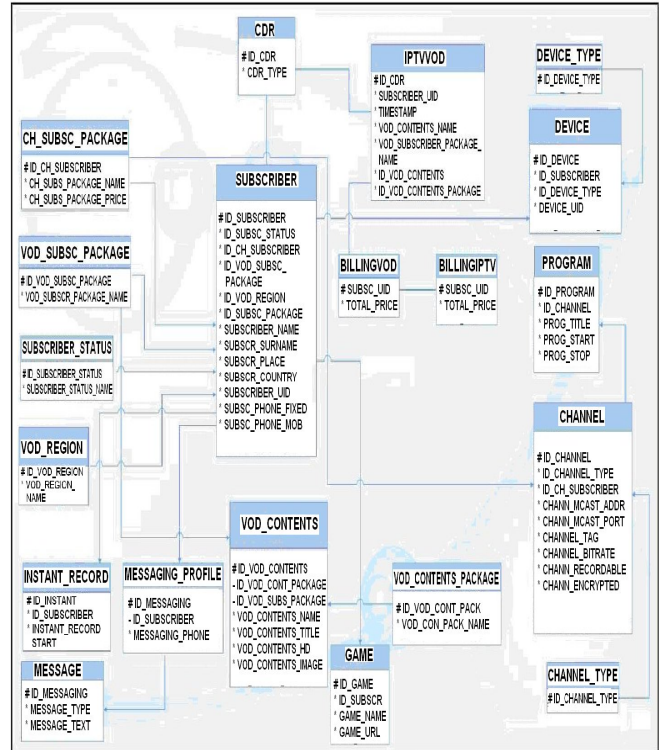


Figure 1. Database scheme of the new Middleware system

The new Middleware system should have an identical database as the old system. The assignment of the team is to specify the design of the new database which has to be compatible with the old database as show on Figure 1. Next to this specification, the teams task is to expand this database with new functions which are defined through consumer and administrative listings of specifications which need to have the new Middleware system [12], [13], [14], [15].

B. Defining the user and administrator listing specification that the new Middleware system has to have

In this phase two teams should be working: one for defining user specifications of the new Middleware system and a team for defining administrative specifications of the new system [7].

The team for defining user specifications of the new Middleware system should be defining the following listed specifications [8], [10], [15], [16]:

- Enable emitting live TV channels as well as SD channels. The new platform should have unlimited number of channels which can be configured. The platform should be secured by arranging the TV channels into certain categories like: all channels, favourite channels, domestic channels, regional channels, informative channels, sports and music TV channels.

- Enable browsing shows which are defined in Electronic Program Guides (EPG). The module for browsing has to be realised so that on demand with a minimum of 2 characters with which the search is going to take place in the EPG. The search results should give information about: starting time of the show, exact name of the show and the name of the TV channel to which the searched show belongs.
- Realize Electronic Program Guide (EPG). EPG should be support for all TV channels. The time period of the EPG should be a minimum of 10 days prior and 10 days in advance. EPG should enable recording all shows from all TV channels. The maximum playing time of one recording should be 6 hours. All shows which have passed should be automatically taped. For all shows in the EPG certain features should be defined like: the name of the show, starting time, ending time, show description and total playing time.
- Support the existence of TV Mosaic. TV Mosaic should give the possibility to watch many different TV channels on the same screen at the same time. The TV Mosaic needs to enable defining an unlimited number of even TV channels on one screen.
- Realize the module Video library in which movies need to be categorized in certain categories like: action, adventure, animated, children, documentary, domestic, drama, history, horror, crime, science fiction, comedy and thriller movies. Every category has to have a unlimited number of movies. Every movie has to have their price, playing time, producers name, main actors name and a short description listed. The purchase of a movie should be made based on the identification PIN which is given to every user.
- Enabling the option of direct recording of TV shows using remote control. Direct recordings will be stored in a file named recordings. Maximum playing time of one recording should be 6 hours. For all recorded shows an option of moving and stopping shows should also be enabled. For all taped shows an option should be enabled so the user can start and stop the recording. All taped shows stay permanently encrypted for one user on his Set Top Box.
- Enable additional option on a user menu like: Radio channels, Internet which enables access to contents from the menu and games where the user can save unlimited number of interactive 3D games.
- Realising the option Settings where the user will have a opportunity to change his PIN, set parental control on a chosen TV channel, set the language on which the TV channel will be emitting, restart their Set Top Box and also have basic settings about their account as well as what an STB IP address is, STB MAC address is and also the name of the software which can be found on his STB.
- Enable the option Help where the management of the IPTV service will be explained. The option help should be full of unlimited help content.
- Enable the option Telephone where all the calls of a user will be inputted which he received on his VoIP (If he is next to being a IPTV user also a VoIP user). Option that he should have are: all calls, outgoing calls, missed calls and received calls.
- Realization of the option Address book where inputting, editing and erasing telephone contacts which number should be infinite is possible.
- Implement the option Messaging where every user that has a VoIP telephone will be able to exchange messages with other users that also have engaged a VoIP telephone service option. The Messaging option should include options of creating new messages, viewing existing once and viewing received messages. The number of existing and sent messages should be unlimited.
- Implementation of the option Chat that should enable the users to between themselves exchange messages. Identification parameter by which the users are going to differ from each other is subscriber_uid that every user has to get when they activate the service. The option Chat should have a realized option of authentication respectively the possibility of accepting and rejecting users for chat. In this option a listing of all chats which one user had till a certain point should be found.
- Support the option of exhibiting the VoIP number on the TV for all users which have the additional option of VoIP. The VoIP number should be shown on the TV when the user is receiving a call from another user.
- Support the option of Message Waiting Indicator (MWI) that should enable displaying textual messages on the TV when a user leaves it on the VoIP telephone which supports the option of leaving voice mails.

The team for assigning administrative specification to the new Middleware system should define the following list of specifications [16]:

- Enable all defined provisioning functions.
- Enable adding, editing and erasing TV and Radio channels.
- Enable adding, editing and erasing TV and Radio channel packages.
- Enable the option of marking TV channels which can be recorded.

- Enable adding, editing and erasing movie contents
- Enable adding, editing and erasing movie categories.
- Enable adding, editing and erasing priced movie categories.
- Enable adding, editing and erasing the movie distributors.
- Enable the option of adding, editing and erasing contents linked to the Electronic Program Guide (EPG).
- Enable the option of adding, editing and deleting interactive games.
- Enable the option of adding, editing and erasing contents linked to the Help option attended for the users.
- Enable the option of adding, editing and deleting contents linked to the Internet option.

C. Criteria for the choice of an external company that needs to design and implement the new Middleware system

In the purpose of choosing a external company which is responsible for the implementation of the new Middleware system it is needed to release a public announcement that consists from two phases: phase of prequalification and the phase of the final partner company choice. In the phase of prequalification all candidates have to satisfy all legal and economic conditions [8]. In regards to the technical and professional requirements, the partner companies have to satisfy the following requirements:

- A minimum of 20 employed IPTV consultants.
- A minimum of one reference of implementation of the IPTV system in the telecom industry.
- A minimum of one reference regarding the exchange of the Middleware system in some IPTV system in the telecom industry.
- A statement that the new Middleware system basis is going to be compatible with the existing basis which is defined in Figure 1.
- A statement that the new Middleware system is going to have a specification listing that is going to be defined in chapter III.
- A statement that the partner company has its own hardware and software infrastructure which is enough for the realization of this project.
- A statement that the partner companies new Middleware system is compatible with the Set Top Box of the following 5 manufacturers: Motorola, Amino, Milinet, Albis Technologies and Technotrend which are already certified for the old system.

The final choice of partner companies that pass the prequalification stage should be conducted on the basis of the following three parameters: the lowest price (with a

percentage share of 50%), the total number of changes of IPTV Middleware systems in the telecom industry systems (with percentage share of 30%) and the total number of realization IPTV systems in the telecom industry (with a percentage share of 20%). The company, which is first in terms of these parameters should get a contract to change the Middleware system. In the event that two or more firms were to have the same number of points, the contract is awarded to the firm which has a large number of references to change the Middleware System.

D. Defining the specification of the network plan and the installation of a new Middleware system by foreign firms

Figure 2 shows the relationship between the Middleware system and other systems of the IPTV service: Video on Demand system, Real Time Encryption system, Verimatrix system, RAC system, Load Balancing system and Monitoring system [8]. The scope of the IP address is 10.120.0.x where x is the number indicated for each server in Figure 2. The team for the installation of a new Middleware system must do so by the same scheme indicated on Figure 2.

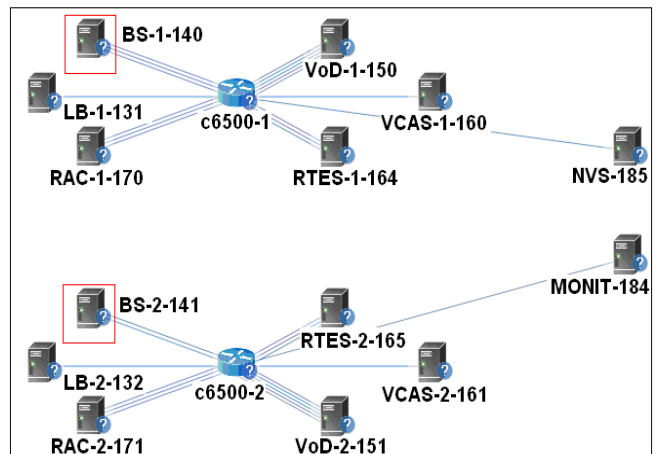


Figure 2. Relationship between a new Middleware system and other systems of the IPTV service

BH Telecom should form a special team to monitor the installation of the system which is being worked on by a foreign firm.

E. Implementation of the new Provisioning system

The Provisioning system represents a link between the central information system of the Telecom Operator and the new Middleware System. The new Provisioning system must support the following operations:

1. Adding new Set Top Box's
2. Changing existing Set Top Box's
3. Deleting existing Set Top Box's
4. Creating a new user

5. Assigning a basic package of channels to the end user
6. Assigning an additional package of channels to the end user
7. Assigning a package of HD channels to the end user
8. Suspension of users (temporarily turned off)
9. Reconnection of users
10. Permanently delete users
11. Deleting an additional package of channels for the end user
12. Deleting an end users HD channel packages
13. Changing the name of the user
14. Changing the surname of the user
15. Changing the address of the user
16. Changing the location of the user
17. Changing the postal code of the user
18. Changing subscriber_uid of the user
19. Adding a VoIP number for the user
20. Changing the VoIP number of a user
21. Deleting the VoIP number of a user
22. Adding a fax for the user
23. Changing the fax of a user
24. Deleting the fax of a user
25. Adding a phone number for the user
26. Changing the phone number of a user
27. Deleting the phone number of a user
28. Adding a mobile phone number for the user
29. Changing the mobile phone number of a user
30. Deleting the mobile phone number of a user
31. Turing on the option for leaving VoIP voice messages on a TV
32. Turing off the option for leaving VoIP voice messages on a TV

F. The implementation of a new Billing system

The basic value changes depending on whether you choose to go with IPTV along with the VoIP service, ADSL service, VoIP and ADSL service, or VoIP, ADSL and mobile services together, which is already defined in the existing Billing system and is not necessary to change when you change the Middleware (Table I).

On the final value of consumption Video on Demand (VOD) service for one of the users indicated in the table billingvod impact parameters from the tables: subscriber, vod_subscriber_package, vod_subscriber_contents and cdr. In the cdr table are written records of each individual purchase of a movie. A software script goes through the database tables and based on the prices defined in Table I form a final price for VOD consumption in one month for one user (Table II). The program script needs to take into consideration during calculations, that every fifth purchase of a movie in one month by one user is free.

The final consumption value of the IPTV services indicated in the table billingiptv are affected by the data in tables: subscriber, billingvod, ch_subscriber_package and whose values are indicated in Table II. Adding values from the tables billingvod and ch_subscriber_package for each user from the table subscriber you get the total value of consumption of IPTV services, which are kept in the table billingiptv.

TABLE I. PACKAGES FOR VIDEO ON DEMAND SERVICES

vod_subscriber_package_name	vod_subscriber_package_uid	vod_subscriber_package_price
Category A	VOD_package_a	0.25 E
Category B	VOD_package_b	0.50 E
Category C	VOD_package_c	1.00 E
Category D	VOD_package_d	1.50 E

TABLE II. PACKAGES FOR IPTV SERVICES

ch_subscriber_package_name	ch_subscriber_package_uid	ch_subscriber_package_price
Basic	basic	12.50 E 27.50 E 32.50 E 47.50 E
Plus	plus	4.00 E
HD	hd	3.00 E

G. Testing the new Middleware system with different IPTV systems

The new Middleware system must be fully compatible with all IPTV systems: Video on Demand system, Real Time Encryption system, Verimatrix system, Monitoring system, RAC system and Headend system [8].

From the central information system all the provisioning functions and all billing scenarios must be thoroughly tested depending on the combination of all the VOD packages (Table I) and IPTV packages (Table II).

H. The migration of information from the old to the new Middleware system

The overall data migration from the old to the new database needs to be done in order for the following tables: subscriber, device, device_type, program, channel, channel_type, ch_subscriber_package, vod_contents, vod_contents_package, iptvvod, vod_subscriber_package, subscriber_status, game, cdr, instant_record, message, messaging_profile, billingvod, billingiptv, vod_region. What needs to be manually configured during this migration is that the value of the id_ch_subscriber_package field needs to be marked CH_SCP_1, the value of field id_vod_subscriber_package is marked as VOD_SCP_1, and the value of field id_subscriber_package is marked as SCP_1. These three values are required, together with data for ch_subscriber_package_name and for Video on Demand field vod_subscriber_package_name, which are defined in

Tables I and II. All other data can be automatically switched from one system to another system.

I. Releasing into production the new Middleware system

If all test results from phase G were positive, a new Middleware system can be put into production. Coordination of the release of the new system into production needs to be done by a special team composed of 3-5 IT professionals.

III. CONCLUSION

The newly implemented Middleware system should solve some existing problems that exist in BH Telecom's IPTV service, and implement some additional functionality [15]:

- The Middleware system's resistance to failure due to the changes that have occurred in other systems of the IPTV service.
- Display a callers VoIP number on TV.
- Display the option Messaging Waiting Indicator on TV.
- Continuous operation of all provisioning functions.
- Interactive chat between users.
- Interactive message exchanging between users.
- Unlimited number of users and TV channels with the option of recording.
- Increasing the bitrate level output signal from the headend of the system from 2.5 Mbps to at least 4.0 Mbps.

Each of the nine-defined phases that need to be changed from the old to the new Middleware system requires formation of an independent team [7]. Each team starts with their activities once the previous team has finished their activities. Previous Middleware systems realizations and other supporting systems such as Provisioning and Billing systems showed that a longer period is needed for the implementation of the phases. Activities of the first team should last one month, and the other team a maximum of 15 days. Activities of the third team should last for 3 months in which time the whole period until the final partner company is chosen and the signing of a contract with them is included. The time frame for the fourth phase is 1 month and 15 days in which time 15 days are included to define the specifications of the network plan and one month for the installation of the new Middleware system. Phases 4 and 5 should take 2 months each because of the complexity of connecting a new system with a central information system. The testing phase of the new system and data migration from the old to the new system should each last 15 days. The last phase, the phase of commissioning the new system into production, is purely informative and should last 1 day.

The total time for the realization of the nine phases is 11 months. However, this temporal analysis does not include

non-working days, which means that the total time for the realization of these phases should be extended 1 month, so the total time for the realization of the project is 12 months.

The testing process of the change of Middleware system in BH Telecom's IPTV service has been done by using test Middleware software versions of some Middleware vendors and these test software versions have included only 10 IPTV users. The test results fully agree with the expected results of a new Middleware system.

Further research in this area is related to the Problem Management process, where any incidents or problems that may arise with the IPTV service after the implementation of a new Middleware system should be investigated [8]. Research should be done at least 6 months after installing the new system and should show the level of efficiency of the new system compared to the old system.

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REFERENCES

- [1] J. van Bon, A. de Jong, A. Kolthof, M. Pieper, R. Tjassing, A. van der Veen and T. Verheijen, "Foundations of IT Service Management Based on ITIL V3", Third edition, September 2007.
- [2] S. Taylor, S. Lacy and I. Macfarlane, "ITIL Version 3 Service Transition", First edition, The Office of Government Commerce, May 2007.
- [3] I. Menken and G. Blokdijk, "The Change Management Guide: The Missing it Change Management Planning, Process, Theory and Tools Guide – Itil Compliant", Second Edition, December 2009.
- [4] I. Menken and G. Blokdijk, "Software Testing and Quality Assurance with It Change Management Transition", First Edition, December 2008.
- [5] J. Dugmore and S. Taylor, "ITIL V3 and ISO/IEC 20000", First Edition, March 2008.
- [6] J. v. Bon, M. Nugteren and S. Polter, "ISO/IEC 20000", First Edition, May 2006.
- [7] A. Tanovic and F. Orucevic, "Implementation of the Information System of the Telecom Operator Using the ITIL V3 Methodology for the Service Design Phase", 2nd International Conferences on Advanced Service Computing, pp. 82 – 91, November 2010.
- [8] A. Tanovic and F. Orucevic, "Comparative analysis of the practice of Telecom operators in the realization of IPTV systems based on ITIL V3 recommendations for the Supplier Management Process", 6th International Conference on Systems ICONS 2011, pp. 115 – 121, January 2011.
- [9] U. K. Tripatji, K. Hinkelmann and D. Feldkamp, „Life Cycle for Change Management in Business Processes using Semantic Technologies“, Journal of Computers, vol. 3, pp. 24-31, January 2008.
- [10] J. Kramer and J. Magee, "The evolving Philosophers Problem: Dynamic Change Management", IEEE transactions on software engineering, vol. 16, pp. 1293 - 1306, November 1990.
- [11] H. Cheng, Y. Xia and X. Hu, "Requirements Change Management of Information System Based on the Keyword Mapping", 6th Wuhan

- International Conference on E-Business, vol. 3, pp. 135 – 140, May 2007.
- [12] S. Ahn and K Chong, “Requirements Change Management on Feature-Oriented Requirements Tracing”, Computational Science and Its Applications – ICCSA, vol.10, pp. 296-307, May 2007.
- [13] R. Weber, T. Helfenberger and R. K. Keller, „Fit for Change: Steps towards Effective Software Maintenance“, 21st IEEE International Conference on Software Maintenance, vol. 10, pp. 26-33, September 2005.
- [14] S. Adesola and T. Baines, “Developing and evaluating a methodology for business process improvement”, School of Industrial and Manufacturing Science, Cranfield University, vol.11, pp. 37-46, May 2005.
- [15] K. Oh, Y. Park and S. Park, “Middleware Architecture of Hybrid Digital Cable Receiver for Cable Broadcast and IPTV Service based on OCAP”, International Conference on Consumer Electronics 2008, ICCE 2008, pp. 1-2, January 2008.
- [16] G. M. Lee, C. S. Lee, W. S. Rhee and J. K. Choi, “Functional Architecture for NGN-Based Personalized IPTV Services”, IEEE Transactions on Broadcasting, vol. 55, pp. 329 – 342, June 2009.