

ZRÍNYI MIKLÓS
NATIONAL DEFENCE UNIVERSITY
Strategic Studies PhD Course

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**NETWORK MANAGEMENT OF THE HUNGARIAN DEFENCE FORCES
FIELD COMMUNICATIONS SYSTEM**

THESIS BOOKLET

extract

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1. Description of thesis research

The role taken on in NATO by the Hungarian Defence Forces (hence HDF) as well as the higher incidence of disaster relief operations have brought the need for basic changes in the structure of field communications systems. The new requirements are as follows: quick and flexible network planning, the transformation of the network, high availability and the need for joint cooperation with NATO and non-NATO countries. To comply with these requirements it is necessary to raise the level of development of the field communications systems to the highest.

As a result of the tenders aiming at the modernization of the field communications systems, the suitable equipment has become highly developed but the real time network management of this equipment has still not been solved. In my thesis I will examine what type of management of field communication system can optimally support the flexible and quick network set up, reorganization, high availability and safe multinational cooperation in the field communications system. In modern network planning and network operations the management makes it possible that remote configuration, troubleshooting can be carried out. The management increases the efficiency of info communications and turns the necessary processes automatic. I consider that these qualities embodied by the management can greatly support and increase the efficiency of field info communications and in my thesis I will examine the possibilities of realizing the management of field communication system.

The rapidly changing operational background nowadays needs software-based planning, real time network information and the possibility of remote interventions – therefore I will examine the tasks of the management of field communication system from these aspects.

Among the many options of the concepts of development of field communication systems there was the idea of a system complemented with a grid ISDN switchboard as well as of a system using ATM technology. However, due to the difficulties arisen in the process of development, neither of these ideas were put into practice. At present, based on these previous concepts implemented on IP transmission, a new, modern idea of a field communication system that can be rapidly installed has arisen. Since this process is

still in progress, I consider it is an important topical issue to establish a management of field communication system that can guarantee the high safety level of the field communications system.

The technical composition, structural principle and requirements system of the field communication system greatly differ from that of the stationary network. As a consequence, I will examine whether the stationary network management is capable of the continuous supervision of the field communication system.

One of the basic requirements of management is the provision of the corresponding info communications services, which is outstandingly important in field deployments with a specific purpose.

Based on legal regulations and on the tasks of the HDF, field communication is applied in disaster relief operations, national and international exercises, tasks carried out by donated forces and in temporary activities in non-peace times. These tasks and the requirements they pose greatly vary, that is why the management of field communication system has to provide the suitable communication services depending on the special operational and tactical needs. Radio communications, one of the most distinct areas of field communications, is of outstanding importance. At present radio communications disposes of isolated management, restricted to some types of equipment. This management of field communication system, however, can only independently handle narrow segments of radio communications, not the whole of the network. I will examine the possibility of the introduction of a radio management system into the field communication system of the HDF, which would enable efficient planning, coordination and operation as well as trouble shooting and circulation performance management of the field communication system. I will offer a solution for the operation and planning of radio systems as well.

We also have to be prepared for situations when the infrastructure used by the national stationary network is completely destroyed or when the HDF performs tasks outside the country in cooperation with other nations, as a contributing nation. In such instances the field communication system is deployed on its own, separated, even without connecting to the closed-purpose network. In this case I will examine how the

management of the communications system can be implemented in order to provide rapid restoration and network alteration activities.

My aim is to establish a management of field communication system that can provide more efficient and safer network operation complying with the demands of our times.

2. Research Objectives

1. Through analyses I will define the requirements set towards the supervision of the field communication system in order to underline how it differs from the stationary closed purpose info communications network of management of field communication system and to prove the importance of the separate field management.
2. I will propose the establishment of radio management, which is indispensable for the efficient planning and operation of the radio connections, which are a basic element of field communications. This radio management is not part of the stationary management of field communication system either.
3. I will state the necessity of the establishment of a complex field management of field communication system, which will make cooperation with the stationary and management of field communication system of other nations possible and which complies with the requirements of providing operational and tactical info communications. I will define the basic concepts of the establishment and connection system of field management.

3. The Applied Research Methods

I have studied and processed the bibliography and theses connected to my topic. I have consulted the experts of the field.

I have compared the system of requirements of the stationary and field communication systems to see the importance of establishing a joint or independent management system.

I have examined and analyzed the tasks and activities of the HDF in the course of which the field communication system is deployed to make sure that in the process of establishing the management of field communication system I take into consideration the different priorities.

I have processed, categorized and summed up the essential civil and military standards and recommendations regarding the establishment of field communications.

I have studied the possibility of establishing the organization suitable for the management of field communication system.

I have examined and analyzed the restricted application of such WLAN technologies which at present are not in the use of the HDF for field purposes and which offer excellent supervision and are easy to be traced as well as can reduce the relocation time of certain segments of the field communication system and provide economical network establishment ways.

I have collected experience and carried out analyses to see the importance of the radio communications that guarantee the mobility of field communications and I also analyzed its effect on planning activities.

Taking into consideration the requirements and technical possibilities, I have examined the possibility of establishing the Centre for Field Management and I analyzed the tasks of the centre regarding field information network.

Elaborating the topic

- the tasks, info communications and special organizing and management needs of the HDF that have a crucial impact on providing the services and applications;
- civil and military regulations and recommendations influencing the establishment of field communications management;
- the requirements of disaster relief tasks, exercises, mission and other tasks that influence the establishment of the management of field communication system;
- the main possibilities and obstacles of securing info communications in non-peace times;

- the info communication technologies and devices that are important for field application purposes and their management are tasks still to be solved;
- the requirements set for the field communication system in order to satisfy the special operational needs of peace and non-peace times so that the field management can guarantee the necessary safety conditions for both the commanding and the executive subordinate staff throughout the whole spectrum of the HDF.

3. *The Description of the Research*

In the first chapter I will present the necessity of the management of the field communications system separated from the stationary system by detailing, grouping and comparing the task systems of the application areas. I will also give a summary of the requirements and tasks of the management of field communications.

In the second chapter I will present the special features of the transmission technologies employed in field communication systems from the point of view of management. I will make a proposal for the establishment of the field management composed of different layers built on each other. I will point out the important and not yet utilized possibilities of the various technologies of field info communications and I will outline the possibilities of management.

I will propose the establishment of a joint radio management, which is of outstanding significance both from the point of view of the planning and of the operational phases in securing the radio connection, which is one of the basic elements of the field information system.

In the third chapter I will propose the establishment of a concrete field management system capable of satisfying the needs outlined in the first two chapters, based on the previously presented technological background. I will present the way of establishment, organizational structure and cooperation possibilities of the proposed field management with the closed purpose network management and with field managements of other nations.

In the summary, conclusions, scientific results parts of my thesis research I will draw final conclusions, present the scientific results and I will make recommendations for their implementation into real life.

5. *Conclusions*

With the changes in Hungary's security policies, the need for extensive network cooperation in the field information system is becoming more and more important in carrying out multinational operations. I examined whether the basic info system of the field information system is capable of satisfying the needs of our times without having network management and whether it can provide a high level of support for the operational and tactical activities.

The activities secured by the field information system have to support rapid redeployment, mobility and operation even without a service provider as well as in case of independent operation - eventually without the connection to the stationary closed purpose network – full-scale service. At the same time, it must be capable of providing the data transmission capacity, applications and services typical of stationary networks. Regarding the fact that NNEC is becoming more important, the field communication system of the HDF is facing new national and international tasks as well as the need for efficiently joining the field info communication system of other countries, **the high availability operation of the field information system without network management cannot be carried out at present, in conclusion the establishment of the management of the field communication system is imperative.**

The deployment place and the necessary equipment can unexpectedly change in the light of the tasks. Planning must be quick, operation efficient and prepared for any unforeseen event. The equipment must be mobile and the wireless connections are accentuated. In contrast with this, the stationary info communications system can be planned in advance, has fixed equipment and is not mobile.

While it is permitted to greatly involve outside service providers into the constant management and operation of the stationary equipment, in the case of the field communications system, which is often installed on an isolated area and which has a

significant role even in non-peace times, the involvement of outside service providers must be kept as minimal as possible and the organization should be able to carry out its task independently. **Following the analysis of the operational requirements, I have proved by way of deduction that applying stationary and field info communication support, the requirements for management greatly vary.**

With the field communications system, which is often installed on an isolated area and which has a significant role even in non-peace times, the emphasis is mainly on the independent operation and management of the system. By way of comparison and analysis, I have proved that stationary management is not capable of supporting the field management in the long run, therefore I have recommended **the establishment of an independent management of field communication system.**

I have defined the functions and tasks of the management of field communication system.

I have surveyed the standards and protocol regulating the establishment of the management of field communication system.

I have examined the info communications needs of the operational activities for the tasks carried out by the HDF and I have analyzed their impact on the establishment of the management of field communication system.

The performance management role of the management system is especially important in the case of the field info system as the equipment available from this aspect is rather restricted and the bandwidths are mostly narrow. Optimizing the network traffic greatly improves the safe operation of the system and the quality of the services available for the users.

Based on my analyses, I have defined the requirements for the management of the field communication system, proving this way that this system and the stationary closed purpose info communications system differ from each other and the establishment of the independent management of the field communication system is well-grounded and justified.

In the next part I have analyzed the technologies and applications of key importance from the point of view of the network operation of the field info system. As the process of development of the HDF field info system is going on with great

interruptions and as the present equipment can barely satisfy the needs of the operational and tactical tasks and the needs of the users, I have conducted my analyses based on an IP-based, transport surface grid info system.

Radio transmission is one of the basic elements of the field info system. When planning it, we do not apply relief map simulation software planning, fault management, configuration management or the management possibilities ensuring high security requirement. **At present, the centralized management of the HDF radio's – which would have a significant role especially in field communication - is not solved, not even regarding stationary management either.**

It is recommended to establish a URH RFP system, already recommended in the course of the development of the field communication system. The URH RFP system would also need management to ensure network and operational security.

Taking into consideration the peculiarities of field info communications, I pointed out the modernization possibilities of the planning methodology and operation options of radio communications, which plays a significant role in field info communications. Analyzing the management possibilities, I pointed out that the use of modern radio management shortens the process of network planning and it provides a safe, high availability operational and management service with constant condition feedback and intervention possibilities. It would also guarantee higher network security, as well as the authorization for remote control and intervention.

If the HDF had a well established radio management system, this system would ensure constant connection throughout the movement and regrouping of the field communications system, it would enable the re-planning of the network without delay if certain parts of the field communication system break down and it would provide the service without failures. Besides, radio management would also support the work of the staff responsible for the planning process.

The present plans are not based on the relief map-based software and the maintenance is not supported by the adequate information about the devices or relations. Radio management performed on map-and relief based modules can provide more stable connections and coverage than manual planning. Based on this, **we can state that modern radio management can provide more efficient network planning,**

organization and operation than without management. The radio management created by taking into consideration the special needs of the HDF field info system is indispensable for the efficient planning and operation of radio connections. The efficiency of the field info system and of the operational activity ensured by it is based on the quick reaction and flexibility provided by the operation of the networks, radio nets and directions as well as the controlled handling of the authorizations. To achieve all this, the joint radio management integrated into the field communication management is absolutely necessary.

Based on the above mentioned factors, in my thesis I have proposed the establishment of radio management, which is indispensable for the efficient planning and operation of the radio connections serving as the basis of the field info system.

The EDR speech purpose communication in the HDF disaster relief operations has become so important within the country that it seems appropriate to establish this system for the purpose of field management capabilities.

Out of the technologies still not introduced into the HDF the WLAN capabilities are very important. These devices have quick and cost effective implementation data, which make them suitable for the subsystem of a field info system that frequently changes its place. The software management of WLAN devices makes it possible that planning and configuration, monitoring and intervention are exclusively carried out by our own management staff. All this corresponds to the requirements of applying own forces in the field info system.

The basic condition for operating field networks that handle high level services and a great amount of data transmission is the wide range of equipment that can rapidly be changed, is mobile and offers wide bandwidth connection. These tasks can only partly be carried out by the relays of the HDF. Therefore, in the field info system examined by me, I have planned mobile microwave devices for the grid points, brigade and battalion VPs, as the implementation and management of these devices are favourable. It is of key importance that they are put under field management.

I have analyzed the connection modes, running applications that can be used in the field info system, as well as the advantages and disadvantages of the special features of the manageable wireless technologies to be considered.

I have defined the connection system of the sub – and co-ordination system of the management of the field communication system and the scope of authorization. I have made a proposal for the establishment of the Centre for the Management of the Field Communication System and its support. This Centre is supposed to carry out independent activities, but functionally it is joined to the closed purpose stationary network management and is capable of cooperating with the management systems of other nations.

Taking into consideration the recommended equipment and tasks, I have proposed a structural outline for the management of the field communication system. This management system can only be handled by highly trained personnel whose professional expertise is based not only on mental but also on practical training. Therefore special attention must be paid to the special training of the management personnel.

The Centre for the Management of the Field Communication System is capable of ensuring network security in the basic functions. It is necessary to carefully plan the physical, network and human protection of the management system, however, the system is capable of handling the security functions for the network devices (IPS, firewalls, network virus protection) and carry out the necessary interventions. Besides protecting the network, the management system also needs to be protected, as the system – and management information is highly concentrated here.

Compatibility and security are of great importance in connecting field info systems, therefore I have proposed the creation of a Mobile Interface Module that can provide a manageable raised level performance and security network connections. This grid point module can ensure network filtering when connecting to the info systems of other nations and it would also exclude the interoperability problems of the different types of brands and technologies. The Mobile Interface Module is controlled by the Centre for the Management of the Field Communication System.

I have only schematically outlined the process of classified information flow on the network as the encryption methods and the coding processes are not the topic of my thesis.

It is of great importance to establish a Secondary Centre for the Management of the Field Communication System from the point of view of the security of the Centre for the Management of the Field Communication System. This Secondary Centre can immediately take over and continuously carry out the tasks of the main centre during re-deployment / re-implementations or when the Centre for the Management of the Field Communication System breaks down or is destroyed. And therefore the Secondary Centre should be placed at a considerable distance from the main centre to minimize the possibility of simultaneous destruction or unavailability of the two centres.

The continuous energy supply of the Centre for the Management of the Field Communication System is also to be very carefully planned and the use of renewable energy sources should be taken into consideration.

To sum up, I have proposed the establishment of an independent and complete management of the field communication system that is interoperable with the stationary and field management systems of other nations, satisfy the needs of ensuring operational, tactical info communications. Moreover, I have defined the basic concepts of establishing the field management and its connections systems. Establishing the field management system ensures the safety of the military operations.

6. The new scientific results of my thesis research

1. Based on my analyses, I have defined the requirements for the management of the field communication system pointing out that there is a difference between this system and the closed purpose stationary system and that it is essential to establish an independent management of the field communication system.

2. I have proposed the establishment of radio management, which is vital for the efficient planning and operating of the radio connections that serve as the basis of the field info system. This radio management system is not part of the stationary management either.

3. To increase the safety of the military operations, I have defined necessity of the establishment of a complete field management system, which is interoperable with the stationary and field management systems of other nations and which satisfies the requirements of the info communication security of operational and tactical activities. I have also defined the basic concepts of creating and establishing the management of field communication system and the structure of its connections.

7. Recommendations and Practical Use

My thesis can serve as bibliography for any further research.

It can also serve as a basic document for the future creation and establishment of the Centre of Management of Field Communication System and developments of field info systems, as I have laid special emphasis on the practicality of this topic throughout my research and I have made a proposal that can easily and efficiently put into practice.

In the second chapter I have outlined technical possibilities, which are, however, still not in use and full application. These possibilities can increase work efficiency and safety of operation therefore my thesis can be used for establishing and developing activity automation.

My thesis can also serve as a basis for outlining the requirements for developing radio management software. This type of radio management can handle specifically the manageable types of the radio devices of the HDF on a common platform.

The thesis can also serve as the basis for outlining both the technical, structural and organizational conceptual ideas of the field management.

It can also be a useful tool for the medium and long run plans of the HDF.

8. Scientific articles

Articles:

1. Dr. Sándor Miklós- Magyaréné Kucsera Erika: A zártcélú hálózat forgalmi optimalizálásának problémái, Budapest, Kard és Toll 2005/3, ISSN 1587-558, 104-110 oldal
2. Erika Kucsera Magyaréné: Possibilities of Unified Digital Radio-System in the telecommunication network of the Hungarian Defence Forces Hadmérnök IV. évfolyam 2. szám- 2009. június, ISSN 1788-1919, 357-365 oldal
3. Erika Kucsera Magyaréné: Possibilities of Unified Digital Radio-System in the telecommunication network of the Hungarian Defence Forces II, Hadmérnök, megjelenés alatt
4. Magyaréné Kucsera Erika: Új szélessávú WLAN- megvalósítások alkalmazási lehetőségei a magyar honvédség infokommunikációs rendszerében, Budapest, Felderítő szemle VII. évfolyam 1. szám 2008. március, ISSN 1588-242, 113- 122 oldal
5. Magyaréné Kucsera Erika: WI-FI lehetőségei a Magyar Honvédség tábori híradásában és annak menedzsmentjében, Budapest, Felderítő Szemle, VIII. évfolyam 2. szám, 2009. július, ISSN 1588-242, 98-108 oldal
6. Magyaréné Kucsera Erika: A rádiómenedzsment lehetőségei az MH infokommunikációs hálózatában és tábori hírendszerében, Budapest, Hadtudományi Szemle, megjelenés alatt
7. Magyaréné Kucsera Erika: A tábori infokommunikációs hálózat menedzsmentje Budapest, Honvédségi Szemle, megjelenés alatt
8. Magyaréné Kucsera Erika: A tábori hírendszer hálózatfelügyeleti biztonsági és forgalmi optimalizálása, Budapest, Felderítő Szemle megjelenés alatt
9. Magyar Sándor- Magyaréné Kucsera Erika: Rádióhíradás lehetőségei a béketámogató műveletekben, Budapest, Felderítő Szemle, megjelenés alatt

Presentations:

10. Kucsera Erika: Digitális csatorna szimulátor rendszertechnikai kialakítása, különös tekintettel az oktatásban történő felhasználásra- BJKMF Tudományos Diákköri Konferencia 1997-Vojenská Akadémia V Liptovskom Mikulás Országos Tudományos Diákköri Konferencia, 1998
11. Magyarné Kucsera Erika: A hálózatfelügyelet és lehetőségei a Magyar Honvédség híradó szolgálatánál, XXV. Országos Tudományos Diákköri Konferencia 7. Hadtudományi szekció, Budapest, 2001, ISBN 963 0063 59, 133. oldal
12. Magyarné Kucsera Erika: A Magyar Honvédség zártcélú hálózata és hálózatfelügyelete biztonsági oldalának megszilárdítása, Kommunikáció 2004 nemzetközi szakmai tudományos konferencia, Zrínyi Miklós Nemzetvédelmi Egyetem, Budapest, ISBN 963 86441 5, 145-154. oldal
13. Magyarné Kucsera Erika: A teljes integráció fontossága az MH infokommunikációs hálózatainak menedzsmentjében, Kommunikáció 2005 Nemzetközi Szakmai Tudományos Konferencia, Zrínyi Miklós Nemzetvédelmi Egyetem, Budapest, ISBN 963 7060 11 1, 199-203 oldal
14. Magyarné Kucsera Erika: New possibilities of wireless trend sin the area of mobile infocommunication and management, Kommunikáció 2007 Nemzetközi Szakmai Tudományos Konferencia, Zrínyi Miklós Nemzetvédelmi Egyetem, Budapest, ISBN 978 963 7060 31 1, 166-173 oldal
15. Magyarné Kucsera Erika: Az EDR technológia kihasználásának és menedzsmentjének további lehetőségei az MH zártcélú infokommunikációs hálózatában „A Magyar Honvédség felsőszintű híradó- és informatikai rendszereinek fenntartása és üzemeltetése” konferencia Magyar Honvédség Támogató Dandár, 2009.05.06

Scientific Study:

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17. Magyarné Kucsera Erika: A Magyar Honvédség zártcélú hálózatának biztonsági szempontok szerinti optimalizálása - A Magyar Honvédség Összhaderőnemi Logisztikai és Támogató Parancsnokság Tudományszervezési szekciója 2003

9. Professional background

I was born on 20 August 1976 in Vác.

In 1998 I graduated from the Bolyai János Military Technical College Department of Electric Engineering. In 1997 I was awarded the second prize on the National Scientific Student conference and in 1998 I was awarded the second prize on the International Scientific Student conference in Slovakia.

From September 1998 I was appointed to my first position in the Main Signal Centre of the Hungarian Defence Forces as an operational officer. During this time I was familiarized with the signals technology used in the Hungarian Defence Forces.

Between 2000 and 2003 I graduated from the Zrínyi Miklós National Defence University.

Between 2003 and 2006 I attended the correspondence course Zrínyi Miklós National Defence University Strategic Studies PhD Course.

In different positions I participated in numerous courses and trainings.

Between 2004 and 2006 I took a degree in informatics engineering at the Neumann János Budapest Technical College Informatics Department.

After fulfilling several positions in the Supplier Brigade of the Hungarian Defence Force now I am commander of National Network Management Centre.

I have an intermediate C type language exam in German and English military language.

Since 1998 I have been a member of the Scientific Association for Infocommunications.