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POSSIBILITIES OF UNIFIED DIGITAL RADIO-SYSTEM IN THE TELECOMMUNICATION NETWORK OF THE HUNGARIAN DEFENCE FORCES

Absztrakt

Cikkemben újabb felhasználási- és ezzel szoros összefüggésben monitorozási-, beavatkozási-, felügyeleti- tevékenységeket, lehetőségeket kívánok felvázolni, melyek különösen a tábori kommunikáció során használhatók.

A cikkfolyam első részében a felügyeleti szervezet struktúrájának változtatására, feladatkörének bővítésére teszek javaslatot. A jelenleg rendelkezésre álló, illetve leigényelhető eszközparkkal olyan menedzselhető életszerű megvalósításokat kívánok felvázolni, mely katasztrófaelhárítási- és egyéb tevékenységek során jól használhatók. EDR eszközök képesek állapotváltozás hatására egy másik tevékenységet aktiválni, így alkalmasak pl. tűzjelző érzékelő jelzésénél akár vészkijáratot nyitni, illetve riasztó jelére kijáratokat zárni. Jól használható ez pl. mozgó futárnál, értékszállításnál AVL információkkal együtt nyomon követésre, akár útvonal, ajtónyitás, zárás naplózására is. Ezen lehetőségek jól menedzselve lehetőséget adnak alternatív igények kielégítésére is költséghatékony módon.

The UDR services in the HDF closed purposed network are generally used for exercises, programs, and partial safe-guard activities. Considering the extended experience of police forces the UDR system is exceedingly able to meet the requirement for other homeland tasks too. In the field communication the UDR supported mobility is an advantageous attribution, but it is vitally important to take the characteristics of field communications into account. Taking advantages of UDR it is important to underline the operation safety, which is difficult without management function. The present structure allows only the configuration of an own VPN group and structure independently (the UDR terminals are assigned by the service provider). On the whole, the UDR is well employable in the field communication, although the HDF has only basic managerial functions at the moment. The UDR is basically usable for the non operational tasks with the present assets.

Kulcsszavak: EDR, TETRA, menedzsment, hálózatfelügyelet, infokommunikáció ~ UDR, management, network management, infocommunications

INTRODUCTION

In accordance with the agreement of Schengen one of the users of the closed purposed digital trunked radio network established in the territory of the Hungarian Republic is Hungarian Defence Forces (HDF). HDF uses the possibilities of this technology effectively in several fields. Departmental order 109/2007 (15. 05) of Unified Digital Radio-System (UDR) regulates the laws and obligations of the service provider and users. In accordance with the possibilities given by the general regulations and purchasing of tools in the closed purposed network of HDF significant telecommunication transmission takes place throughout UDR as part of the general telecommunication and during homeland exercises and conferences. The spreading of UDR is accounted that it is a closed purposed type, which is ordered into Virtual Private Network (VPN) and contains easily restructured groups, which can operate remotely reliably.

HDF can use the advantages of UDR in times of peacetime exercises, practises and take part in a disaster relief activity. The international exercises can create possibilities for the testing of connection establishment by mobile repeated and gateway functions in case of areas where there is no coverage and in case of a sudden failure of several basic stations. Also in cases when there is a failure in switchboard and to practice the rapid activity order working together with the management staff.

The principle of establishment of an independent switchboard purchase for the HDF is at present not part of governmental acquisition conception. Therefore beside the present supporting infrastructure, which is based on the four switchboards of the service provider, another NetAct software is recommended, which supports the management of the operating structure. In order to provide quick reaction ability, a terminal with NetAct software is to be introduced. For the handling of continuous fault management information and for quick reaction in case of emergency installations of mobile basic stations for the effective measure have to take place. The knowledge and monitoring of switchboards situated in national areas is indispensable.

EXPERIENCES

The emergency use of UDR was tested during exercises in which (Balaton 2008) several emergency organisations, other nationalities and organisations of the HDF, police and disaster recovery took part. During this testing the experiences were positive. The users could receive good experiences of the UDR system during several exercises, programs for example the meeting of NATO Informal Defence Ministers, patrol competitions, the Redbull Air race, and during the celebration of 20th of August. Although during these programs the equipment was used only for few, mainly group or individual voice calls, these occasions gave a good opportunity for the testing of radio mode group ordering, management activities, and for experiencing the reaction ability.

The Romanian-Hungarian aerial search and rescue exercise held in October 2008 in Mátészalka (Cross Landing) gave a good chance for the testing of mutual task execution ability, cooperation through the HDF UDR and National Ambulance Service, National Disaster Recovery Directorate, National Police Headquarters. It was also a good possibility to test the cooperation ability of the main dispatcher of the HDF and the main dispatcher of the security VPN management. All together the exercise was successful and UDR connections met the requirements. At present the HDF has approximately 1600 terminals, which is to be increased to 2000 in the near future.

This terminal number is so significant that it makes a flexible changeable telecommunication service possible, which beside adequate management can become a stable background for some segments of field communications.

GENERAL PRINCIPLES OF MANAGEMENT

The UDR network users use the same technical infrastructure which is given and managed by the service provider; however they are virtually separated through VPN. The organizing, group forming, and management through the own VPN is placed in the competence of the given organisation. Therefore it is HDF's interest to form a management using all its possibilities and management scheme, which assures rapid and flexible configuration of the groups in the network. Beside necessary configuration, technical tendency, interferences, and problem solving a well established management system is capable of decision making based on the incoming emergency calls, status message.

The centralised management, configuration-, fault management tasks of UDR VPN have to contain the following functions:

- Fault management;
- Configuration management;
- Administration management;
- Help desk function;
- VPN handling;
- Structuring organisation, establishment of programming structure;
- Forming of voice groups;
- Dynamic traffic group ordering of radio group members, ceasing throughout air interface download into radios immediately;

- Cancelling of lost radios;
- Carrying out observation;
- Liaison toward the service provider;
- Handling of dispatchers;
- Preparation of summarized status messages, statistics;
- Tracking of fleet;
- AVL GPS tracking;
- Handling emergency calls;
- Carrying out necessary steps;
- Carrying out necessary steps in case of predefined status messages.

The network management activity in accordance with the closed purposed stationer centralised management principle can be effectively realised in a 24/72 hour shift. The activity of the employees working in shift has to be coordinated by the staff that has more professional technical knowledge. On the 1. figure the rational version structure of performance- and fault management can be seen. It was designed for the organisational structure to satisfy user needs in HDF's VPN.

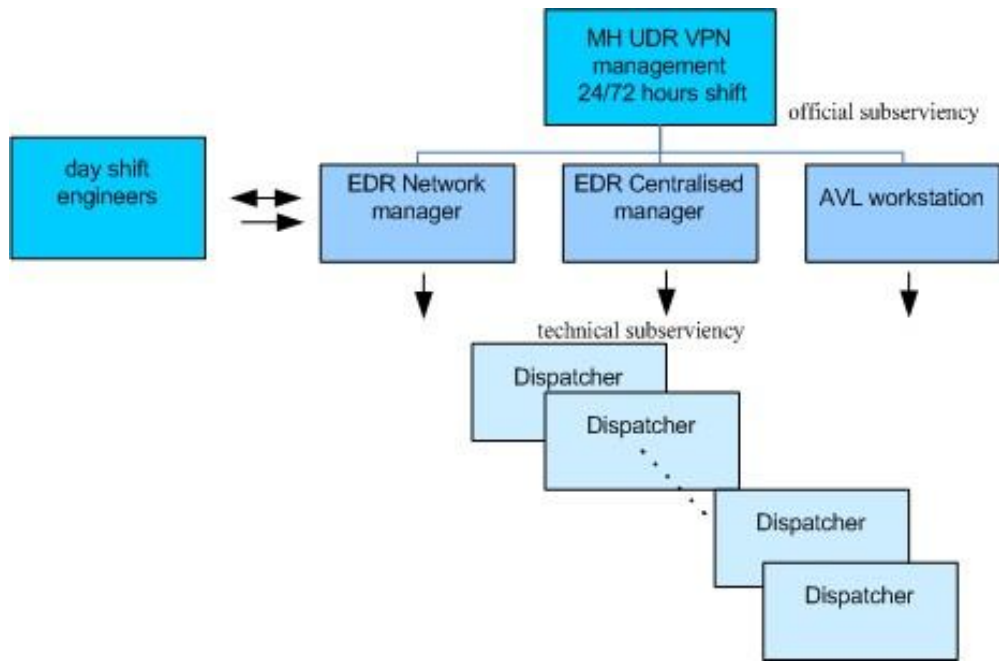


Figure 1. The structure of performance- and fault management

The following chart contains an example of organisational items:

Executer	Tasks
UDR network managers	Fault management; Contact with contractors; Help desk functions; Cancelling lost radios; Handling dispatchers; Monitoring; Handling of emergency calls; Carrying out necessary steps.
UDR centralised dispatcher	Configuration management; Configuration of the equipment; Handling of administration management; Forming voice groups; Dynamic traffic group ordering of radio group members, ceasing throughout air interface download into radios immediately; Setting of priority cutting off parameter; Call forwarding; Call recording on the basis of authorisation.
AVL authorised user at work place	AVL information handling; Tracking; In case of leaving the authorised route making of checking calls; Steps according to given regulations for reinforcement of GPS coordinates, rescue or back up.
Engineers working on day shift	Structuring organisations, establishment of programming structures;

	Handling of VPN; Preparation of summarized status messages, statistics; Preparation of an infocommunication plan for the needs of exercises and missions.
Dispatchers	Carrying out necessary steps in case of predefined status messages; Scanning; Coordination of group communication

For the continuous maintenance of service the VPN centralised management network has to have at least two different routes. Duplication of the dispatcher terminal with eligibility is strongly recommended in the reserve management centre.

The maintenance of the network is the responsibility of the service provider. However, monitoring of the state of the network can provide rapid and effective network transformations in case of switchboard failure or basic station cut off. Therefore the integration of the fault management software provided by the service provider is necessary for the system of HDF UDR.

The activity of the managements operates horizontally from the organisational and professional level to the dispatcher level.

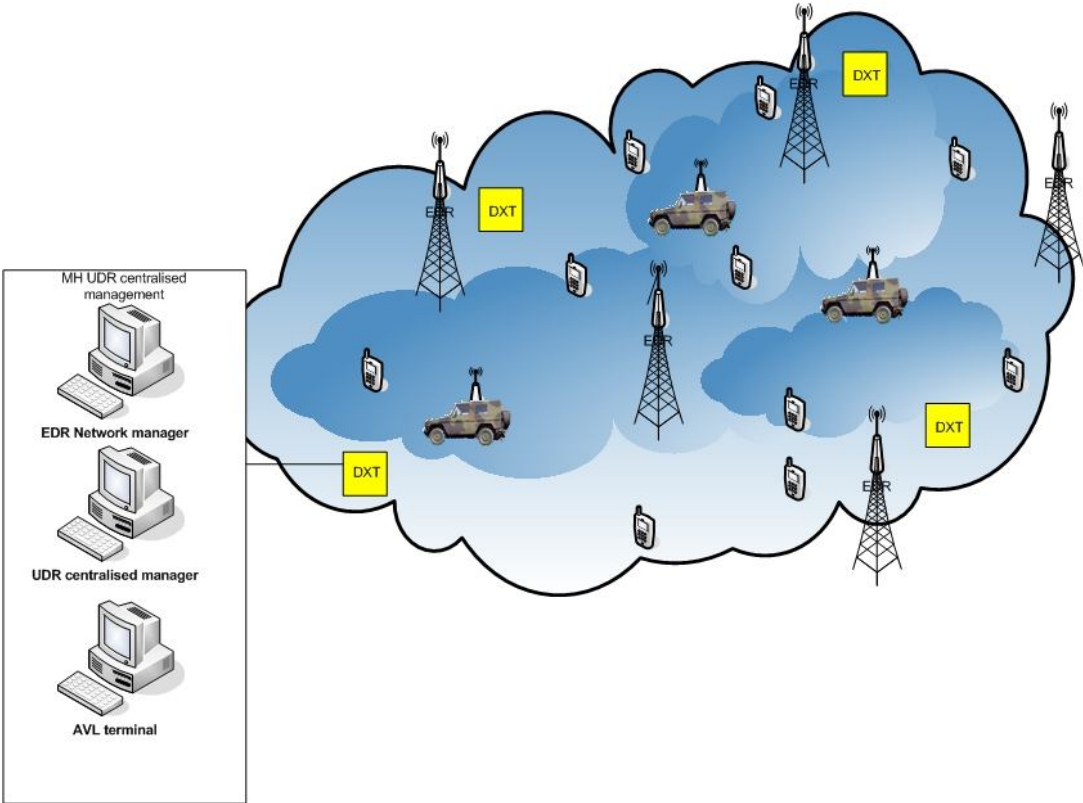


Figure 2. Technical solutions of management.

FIELD APPLICATION AND ITS MANAGEMENT POSSIBILITIES

The telecommunication connections, which are to be set up in the national areas can be quite well effectively established if the significantly high national UDR radiation coverage (especially mobile 10 W) is considered and there is no ruined infrastructure. Also without coverage, provided by the service provider, the UDR communication can be used well with the help of a mobile gateway and repeater for the part of the closed purposed network.

It is possible to cover on area with the so called island mode with the help of mobile basic stations and a DMO gateway or repeater in case of covering an area with difficult radiation. This can be useful in case of a group placed for a short time in an area for a signal task. In case of island mode group calls can be made from all channels of basic stations, emergency calls have priority. When using this mode a group call connection can only be made with the equipment that is connected to the network and near the basic station. There is a disadvantage of the island mode, the dispatcher cannot reach the mobiles, there is no connection with the switchboard and no possibility to use the packet switched data transfer. Without network connection there is no authentication and air interface encryption, and the AVL terminals cannot get GPS coordinates from the UDR equipment. To summarize, the island mode is not advantageous from the point of view of the management, because the download of the radio mode is impossible after pre-adjusting.

From the point of applicability the UDR can be able to provide appropriate communication with the use of preconfigured mobile terminals and a mobile basic station where there is absolutely no network coverage (eg. searching activity in a special area). But in this case it is important to connect the basic station to the stationer or mobile segment of the enlarged closed purpose network to create the network management function.

One of the specifications of field communication is that only small closed groups are communicating during the tasks and in these cases the DMO services can meet the requirement. Furthermore, if a continuous communication is needed with the component of an enlarged network (e.g. with the peacetime support staff), the usage of gateways can ensure the suitable communication between DMO and TMO groups. Latter has a great advantage that is easy to manage, because the network manager is able to manage, configurate the TMO groups and can collect status information.

Although the gateway function is available in some handheld equipment, the most effective way is built in a vehicle. With this solution we can get a very flexible gateway solution that can operate with its own antenna instantly or with the installation of an outside antenna that provides greater sign strength in a couple of minutes. The fast applicability makes it very useful for example during exercises where there is not enough network coverage caused by the character of the terrain. Using gateways we can make a connection with troops at a levee through the network and we are able to execute continuous searching tasks as a result of the possibility of making connection from a moving communication. In the short run the gateway operates from its own accumulator, in the long run from a generator. From the point of management, if the dispatcher is a member of a TMO group, the manager can/cannot send the configuration through the air.

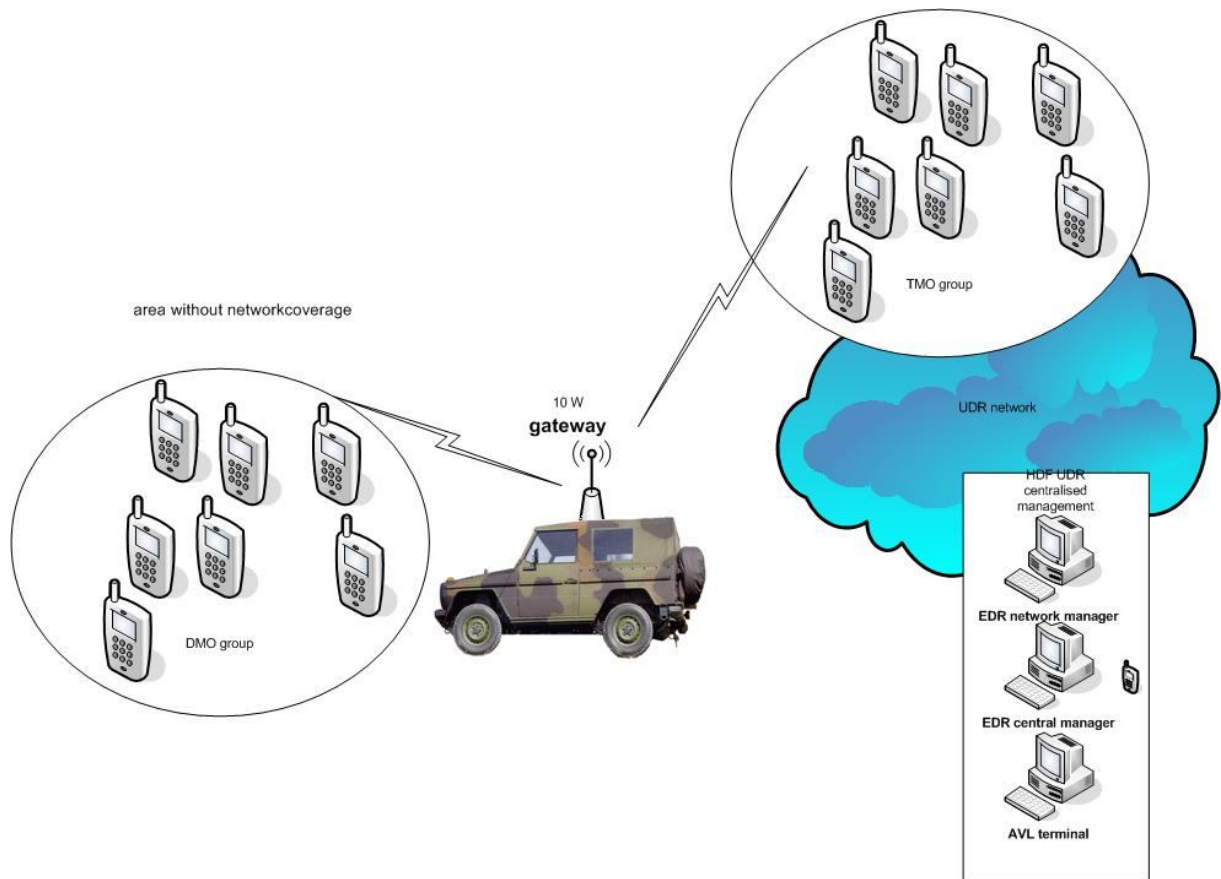


Figure 3. Possibilities of gateways

Using a DMO repeater within the DMO, the distance is longer between the mobile radios during the conversation. There is a great advantage that the repeater built in a vehicle can provide an independent UDR communication in a smaller area. It can be useful at the initial installation of field communication, patrol activities, because the coverage of a normal DMO will be extended. Therefore it is very useful as a backup possibility in the field communication and it is indispensable for the planner. The repeater provides the voice service between the users in case of the entire fall out of network.

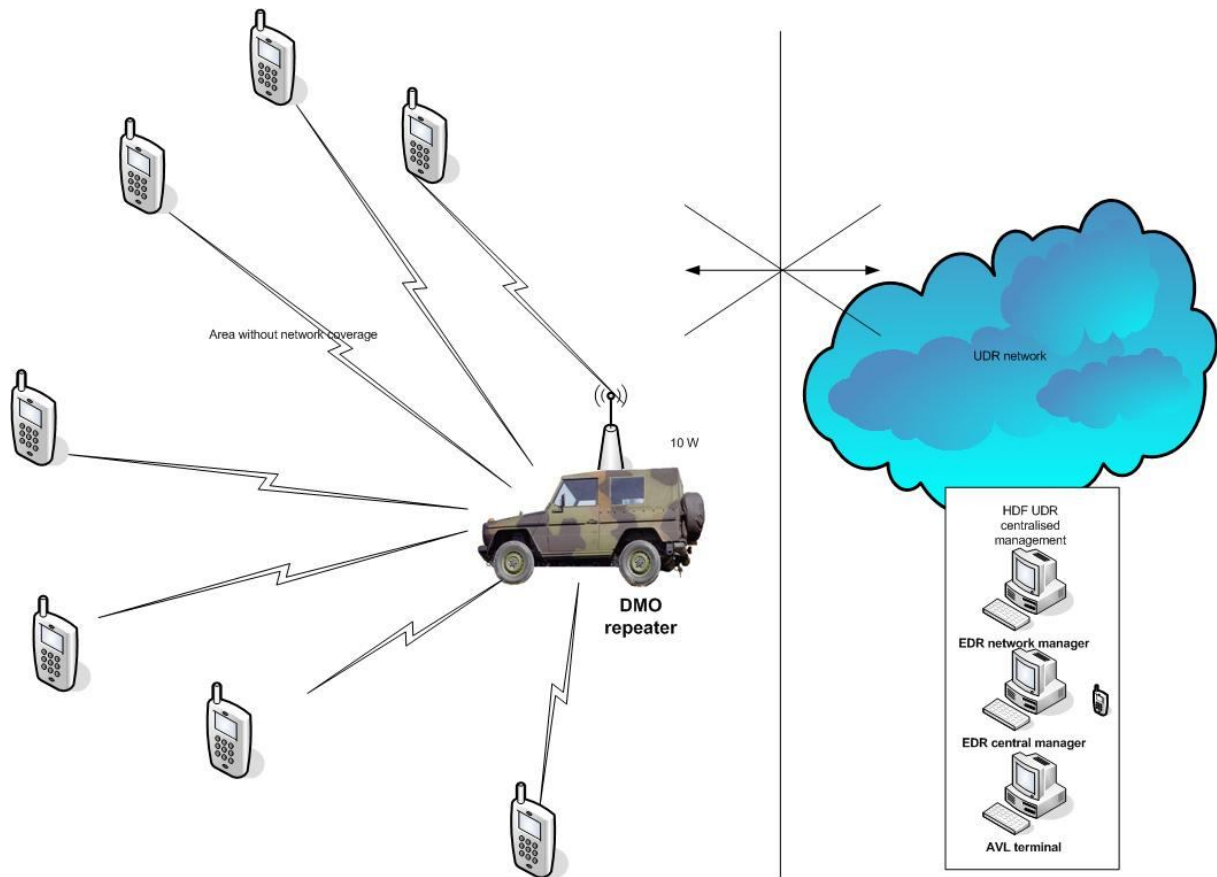


Figure 4. DMO repeater disadvantage

TMO repeater provides the most effective service, which contains more professional radiator and allocation, longer distance possibilities depending on the type of antenna, and a more stable network connection. With this solution we can achieve the full range of individual-, group-, management possibilities. It can be quite useful in search and rescue tasks, difficult relief situations, or where the network coverage is not available (e.g. tunnel, cave, inside building ...) to extend the UDR network. The readiness time for the troops is approximately half an hour with the repeater built in a vehicle. The advantages of the repeater built in a vehicle is the same as the above mentioned gateway solution advantages.

The management takes the configuration of the equipment, but it is a disadvantage that it needs a serious network performance. Unfortunately, it can happen that the mobile terminals from the edge of a cell connect to the repeater and not to the nearest basic station. The involvement of a service provider is necessary.

It should be mentioned that the coverage provided by the service provider is done by repeaters that connect to the donor basic station.

The application of the UDR system can be advantageous in case of safeguard, patrol, and service activities, because beside the general voice service other services are available at the same time. For example with the UDR the smoke detector can open an emergency door or an alarm system can close doors automatically for security reasons.

CONCLUSIONS

The UDR services in the HDF closed purposed network are generally used for exercises, programs, and partial safe-guard activities. Considering the extended experience of police forces the UDR system is exceedingly able to meet the requirement for other homeland tasks too. In the field communication the UDR supported mobility is an advantageous attribution, but it is vitally important to take the characteristics of field communications into account.

Taking advantages of UDR it is important to underline the operation safety, which is difficult without management function. The present structure allows only the configuration of an own VPN group and structure independently (the UDR terminals are assigned by the service provider). According to the present regulations the service provider takes the management function of the switchboards and basic stations for ten years. The HDF managers have no eligibility to get the status of the system either. It means significant disadvantages during the operations and maintenance of field communication, therefore I suggest a management terminal installation in the above mentioned organisational structure after the authorisation procedure. Hereby the management gets all the information from the system at monitoring level and they can encroach immediately in case of switchboard failure, natural disaster, destruction of infrastructure.

On the whole, the UDR is well employable in the field communication, although the HDF has only basic managerial functions at the moment. The UDR is basically usable for the non operational tasks with the present assets.

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