Fekete Károly

The Main Technical Characteristics of the Insular Telecommunication Network for Purpose of Government of the Hungarian Defense Forces

In recent years much research has been devoted to the development of ITNPG of HDF; nevertheless, few have refined the exploration of the main properties of this system. After years of step by step development of ITNPG, we show the crucial technical characteristic of the stationer CIS. In order to highlight the importance of this issue, we demonstrate that the unavoidable technical reforms cannot be put through within the framework of the current PDH.

Keywords: Insular Telecommunication Network, Hungarian Defense Forces, technical characteristic, PDH, DOTMLPFI, ISDN

Introduction

There is a continuing need for increased communications capacity for military applications, especially in the area of the network-enabled capability operational concepts. The permanent availability of different kind of military and civilian networks on the battlefield in the beginning of the 21st century allow us to use almost any kind of form of information transfer.

Apart from C3 planning the capability based approach of DOTMLPFI can also give guideline to other defense planning disciplines - with the adaptations of those specialties - in creation of new capabilities [1].

Not considering the massive quality development of the stationary military communication network in Hungary, we have a special situation now: the military users should use double kind of transport services. The ISDN based network allows data transfer on base of classical telecommunication protocol and the IP based segment is working on internet protocol.

Large-scale changes and developments in communication have garnered interest from both electrical engineers and information theorists for the last several years. Nevertheless, a confirmed riddle in info-communications is the development of a model of long range dependence (LDR) of information flow. Unfortunately, this approach is not entirely considered typical, because the main characteristics of network traffic (e.g. Internet) are

totally different from the perimeters of classic telephone networks and we have to face a special problem: the classic network's traffic is static, because the general user's behavior is limited and well predictable.

To find the best effectiveness of the existing complex network working simultaneously we might find the main qualities and parameters what are impact on.

In order to accomplish this aim, we concentrate our efforts on verifying that ISDN and IP network can cooperate to surmount this quandary.

We proceed as follows. To start off with, we provide a short legislative and technical background. Along these same lines, to fulfill this ambition, we suppose that integrated services digital network protocol and voice-over-IP can interfere with network QoS (Quality of Service). Continuing with this rationale, we place our work in context with the prior work in this area. Finally, we draw conclusions.

Legislative background

Nowadays in terms of DOTMLPFI (Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, Interoperability) the capability based approach is much more sophisticated within the confines of the defense planning disciplines. The scope of comprehensive approach of DOTMLPF-P and the aligned development of the related areas are accepted within the Alliance. The capability requirements of CCR-16 (Capability Requirements Review 2013) have also been elaborated taking DOTMLPF-P into account [2].

DOTMLPF-P is the DoD acronym that pertains to the eight possible non-materiel elements involved in solving warfighting capability gaps[1].

These solutions may result from a Capabilities-Based Assessment (CBA) or any study that investigates DoD warfighting capabilities and identifies capability gaps. DOTMLPFP is cited in CJCSI 3170.01, Joint Capabilities Integration and Development System (JCIDS) and described in detail in the JCIDS Manual [3].

According to the Act CXIII of 8 January 2011 and to the 15th §. of the Government Decree of 290/2011. (XII. 22.) info-communications support of Operation Command and Control System of Hungarian Defense Forces (HDF) is guaranteed by the systems of Governmental Insular Telecommunication Network[2]. As stated in the Government Regulation of 346/2010 (8 December) Hungarian Defense Forces have the right to operate an insular telecommunication network. The Insular Telecommunication Network for Purpose of Government of the Hungarian Defense Forces (ITNPG of HDF) consists of the

[1] The DOTMLPFI approach had a significant role in the forming of the AMN (Afghan Mission Network) and the NATO FMN (Future or Federated Mission Network).

[2] Plus some leased lines and services.

Stationary Communications and Information System (CIS) on strategic level and mobile CIS on operational and tactical level.

The Joint CIS Doctrine of HDF was signed by Minister of HDF in 2013 and based on NATO CIS doctrine (AJP-6), AMN, FMN, different NNEC conceptions and STANAG-5048.

In case of the revision of CJCIS Doctrine and to support the minimum level of CIS services of NATO Common Joint C2 operations should be adopted the NATO MC-593/1 document (Fig.: 1) with special regard to the experiments of the NATO Joint Multinational Operations and DCM (Deployable Communications and Information System Module).

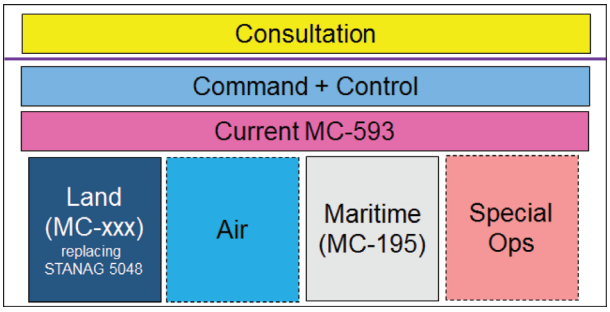

Figure 1: MC-593 frame-document for NATO Joint Operations

Technical background

In the 1980s the CIS of HDF consisted of some AR. ARF, ARM (crossbar) and EP, EPK telephone exchanges. They were connected to each other by digital microwave radio lines Orion RP-120/2. At the time of the Warsaw Pact, the development of modern microprocessor based PBXs was limited because of the COCOM[3].

After the end of communism in Hungary and especially after joining PfP and NATO it was clear that we should change our military CIS according to the recommendations of NATO. Our first procurement was 26 pcs ISDN switches from Siemens (HICOM). At that time the main aim was to guarantee the support radar data flows, ASOC and to make it possible to connect to the NATO IVSN and NATO Core Network. To support the technical compatibility and interoperability between the elements of CIS HDF kept in system the HICOM and HIPATH switches working on the base of the QSIG common channel signaling protocol (Fig.: 2).

[3] Coordinating Committee for Multilateral Export Controls.

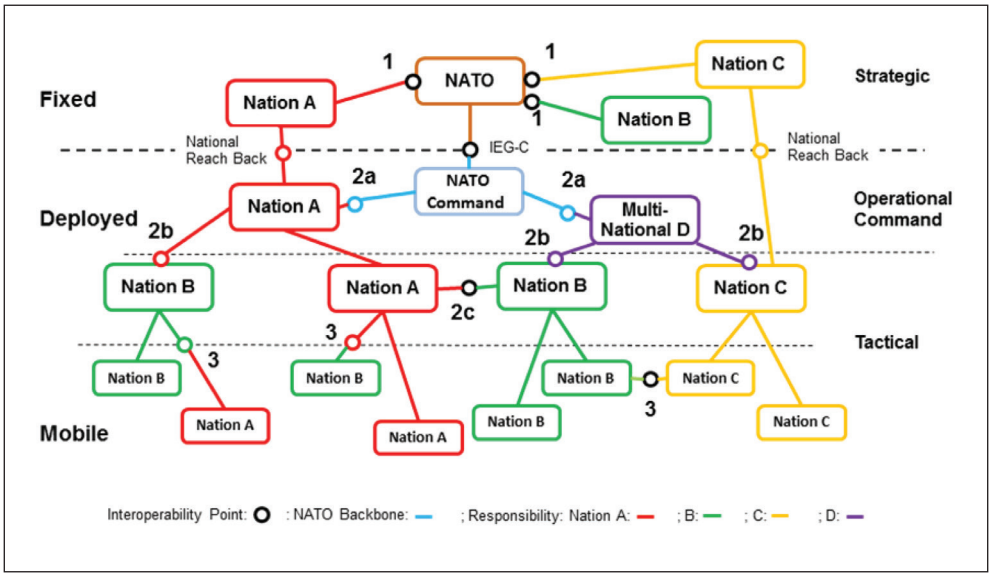

Figure 2: The system of points of interoperability

The ITNPG of HDF has different network layers:

- Transport layer (which is responsible for only the transport between ISDN switches without any kind of traffic communication);
- Traffic handling network (switching, routing);
- User network (human-machine interface, end-to-end connection).

The transport networks of ITNPG of HDF are:

- Microwave Network;
- Optical lines;
- Copper cables;
- Leased lines;
- VSAT connections.

The traffic handling networks can be:

- ISDN;
- MPLS[4] Transport Network;
- Multiplex Connections.

The user networks are:

- Voice, DCI;
- Data (e.g. KGIR, VTC, Link11B).

The main and uncial network layer element is stationary microwave transport network which consists of more than a hundred microwave stations, connected to each oth-

[4] MPLS: Multi-Protocol Label Switching.

er by point-to-point. These stations can serve as node-, end-point and active or passive retransmission stations.

After the migration of frequency from 2 GHz in 2Yk the microwave stations were changed to TDR. Under the umbrella of a "Transport" program an information broadband ring was created in 3 steps in 2005, 2008 and 2013 respectively.

As the result of the constantly evolving connections the stationary microwave network took on mainly a meshed, point-to-point and ring oriented topology (Fig.: 3).

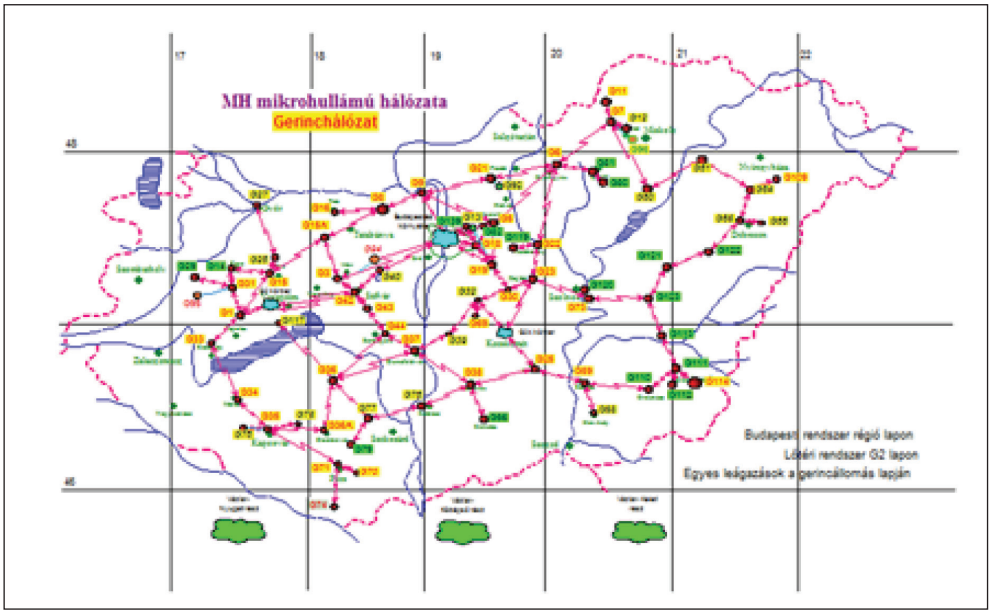

Figure 3: The one moment of evolving topology of the microwave network

The microwave transport network has four regional rings (8xE1, 16xE1) to the HICOM and MUX connections and one E3 ring for the information backbone. There are several diagonal- and interconnections within and between the rings for the purpose of increasing the endurance of the rings and sharing the traffic communication between them (Fig.: 4).

Analyzing the current topology of the microwave transport network, we may state that:

- The transport network works on PDH[5];
- The maximal transport speed is limited to 16xE1 (16x2 Mbit/s) or E3 (34 Mbit/s);
- The main modulation method is PCM with TDM;
- The synchronization of the individual stations is difficult;

[5] PDH: Plesiochronous Digital Hierarchy

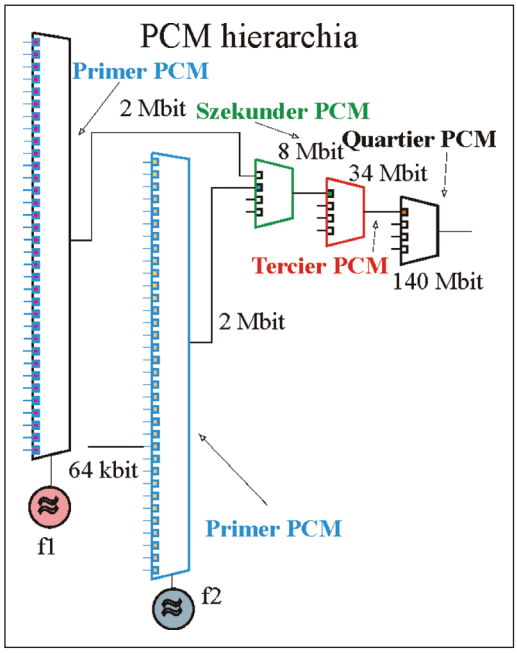

Figure 4: The PDH limitations of the PCM based microwave transport network

- The possibilities of the PDH network management are limited.

The traffic handling network is built with more than fifty HICOM and HiPath exchanges and some of the small digital PBXs (EPF, Panasonic, Samsung, Alcatel, CA). To ensure the technical quality of service every exchange is connected to the military users and almost every exchange can serve as a transit exchange. Small amount of the exchanges are gateways to other networks (GSM, VSAT, IP-telephone systems). The traffic handling network has a specialized, virtually separated closed telecommunication data network. The MUXs (P303V, P143L, PMX30 and the intelligent RAD Megaplex 2104) are connected to the microwave stations or other transmission equipment (modem, optical interface) to insert the basic rate channels into the PCM frames.

The classic ISDN exchanges are the HICOM 330 E/H or 350 H. Both of them are able to support the local Ethernet LAN and remote access to the distant Ethernet LAN. These exchanges are ready to support the main type of ISDN and supplementary services such as:

- Conference (network conference);
- Redial, Call hold;
- Do-not-disturb;
- Call routing;
- Call transfer;
- Calling Line Identity;
- Direct Station Select.

The HiPath 4000 (4300 and 4500) is able to support the military communication by ISDN and IP protocols respectively, but in the ITNPG of HDF the main application is ISDN only.

The Telecommunication Management System uses its own ISDN network by the HIPath Management System (HPMGR). The main services of the HPMGR are:

- HiPath Fault Manager;
- Configuration Management;

- Application Programming Interface;
- Performance Management;
- Collecting Agent for tarification;
- Direct Access;
- and Account Management.

In the ITNPG of HDF due to the MPLS technology we may find CISCO VoIP active elements. They support about a thousand VoIP telephones around the country. The VoIP system is able to connect to the ISDN or IP network. The connection to the IP network is carried out through special ISDN-IP gateways (Voice Gateway). The calling service is supported by call manager servers. They are organized into one of the seven call manager groups.

Conclusion

As the result of the analysis of the legislative regulations and the technical specifications we conclude that the main characters of ITNPG of HDF are:

- Meshed, multilevel, multilayered and very complicated network;

Considering its size, difficulties and technologies the ITNPG is comparable to the civilian communications network;

- Based on an integrated services partially converged network;

Consists of different kind of Multi-generation Protocols (from MPLS, TCP/IP, SDH, ATM, Frame Relay, PCM and ISDN to the analogous ones).

We concentrated our efforts on showing that the ITNPG of HDF is made not in an adaptive, flexible and embedded way. One potential flaw of our system is that it may not change its own configuration and topology automatically and adapt very different architectures itself. On the other hand, the potentially obsolete PDH system of the ITNPG now might break the next technological barrier as we introduced it more than ten years ago. We plan to address this in future work. To analyze the communication traffic behavior within the ISDN frame, we described the current ITNPG. The characteristics of ITNPG, in relation to those of more acclaimed methodologies are more typical. In our next paper we hope to move on to investigating and finding evidence in the very near future.

References

[1] Gaspor Tibor: *A Magyar Honvédség Telepíthető Híradó és Informatikai Rendszerének Képességalapú Fejlesztése.* Évfolyammunka. Nemzeti Közszolgálati Egyetem Hadtudományi és Honvédtisztképző Kar Felsőfokú Vezetőképző Tanfolyami Központ, pp. 6–7, Budapest, 2014.

[2] David Cathro: *NATO Defence Planning Process (NDPP): ACT Staff Element Europe, Mons*, https://pfpconsortium.org/system/files/03_NATO+Defence+Planning+Process.pdf (2015. 01. 15.)

[3] ACQuipedia: DOTmLPF-P Analysis, https://dap.dau.mil/acquipedia/Pages/ArticleDetails.aspx?aid=d11b6afa-a16e-43cc-b3bb-ff8c9eb3e6f2 (2015. 01. 12.)
4th draft of MC 593/1 Minimum Level of Command and Control (C2) Services Capabilities In Support Of Combined Joint NATO Operations in a Land Based

[5] Rajki János: *A Magyar Honvédség Stacioner Híradó hálózatának modernizálási lehetősége a jelenlegi infrastruktúra továbbfejlesztésével.* Thezises. National University of Public Service, Budapest, 2014.

[6] John M. Griffiths: ISDN explained, 1.8: Early ISDN, Library of Congress Cataloguing-in-Publication Data, New York, USA, pp. 95-100, ISBN 0 471 93480 1, 1992.

[7] Fekete Károly: *A Magyar Honvédség állandó telepítésű kommunikációs rendszere továbbfejlesztésének technikai lehetőségei.* Doktori (PhD) értekezés. Zrínyi Miklós Nemzetvédelmi Egyetem Tudományos Könyvtár, 2003.

A Magyar Honvédség Kormányzati Célú Elkülönült Hírközlő Hálózatának legfontosabb technikai jellemzői

Fekete Károly

Az utóbbi időben jelentős kutatásokat szenteltek az MH KCEHH továbbfejlesztésére; mindazonáltal közülük kevés emelte ki ennek a rendszernek a legfőbb jellemzőit. A KCEHH éveken át tartó, lépésről lépésre történő fejlesztését követően rámutatunk az állandó telepítésű híradó- és informatikai rendszer legfontosabb technikai jellemzőire. Annak érdekében, hogy világos legyen ennek a kérdésnek a fontossága, demonstráltuk azt, hogy az elkerülhetetlen technikai reformok nem hajthatók végre a jelenlegi PDH keretei között.

Kulcsszavak: Kormányzati Célú Elkülönült Hírközlő Hálózat, Magyar Honvédség, technikai jellemzők, PDH, DOTMLPFI, ISDN