Article

The Path to Digital Communications

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Photo: Bittium

Kapsch BusinessCom was awarded the contract for the Tactical Communication Network (TCN) on 18 December 2018. Roll-out planning was initiated at the same time. Comprehensive changes to the organization of the signal troops and in the training of soldiers are necessary. The TCN enables battalions to form a digital command network to connect sensors, effectors and commanders and his staff to an information backbone.

The roll-out of the new deployable communications system must be harmonized in terms of organization, equipment, regulations, and training. In addition, the implementation of all related projects is to be synchronized, in order to quickly ensure that the TCN can be used in the field and improves the command control effectiveness. The challenges lie in simultaneously ensuring permanent command and control with the old system and the consistent implementation of the TCN project. A "Broadband On-the-Move Network" down to company level will subsequently form the basis for digitalization in all areas of the Austrian Armed Forces (AAF).

With the contractor Kapsch BusinessCom (KBC), the requirements in the AAF service specifications were grouped into areas and prioritized as part of the overall implementation planning, in preparation for the detailed planning phase. In successive iterations, the requirements for each area were prepared for roll-out and documented in close technical coordination between the Austrian Federal Ministry of Defence and the contractor. The respective documents serve to specify the requirements stated in the AAF service specifications and as a basis for quality assurance and quality acceptance.

The details of the equipment with components and the devices in the various carrier systems (shelters, command vehicles, etc.) as well as the equipment of the operating, transport and storage containers were coordinated with the client in the detailed planning. The requirements of the Austrian Federal Ministry of Defence were fully taken into account. The Army Logistics Center (ALogC) in Wels was set as the delivery location and the location for the installation of the TCN system components.

Roll-Out Planning by the Ministry of Defence

As part of roll-out planning, it was first necessary to map out all the development processes and other areas affected within the Austrian Armed Forces, and to implement them within a working group, following a harmonized procedure and schedule. At the same time, based on the basic decision made, all the parameters had to undergo detailed evaluation and response assessment.

The Lines of Development, namely
- Provision of equipment
- Regulations
- Training
- Infrastructure

and for the projects in connection with the TCN, measures were taken and set, as shown in Figure 1.

Organizational Development: Signal Corps

An organization is the permanent constellation of personnel, materials and tasks in a structural and procedural context. The aim is to ensure maximum organizational balance through a stable and flexible structure. The concepts of task analysis and task synthesis, a method known from organizational theory, were used (see Figure 2). The task analysis for the new TCN equipment was developed based on the experience of the force.

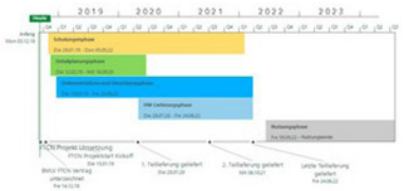

Figure 1. TCN implementation schedule (Illustration: Kapsch BusinessCom)

The subtasks required to establish operational preparedness were presented in detail, and general combat duties such as self-protection were taken into account. In the subsequent task synthesis, the organizational structure was developed, including the definition of task complexes and the creation of roles.

Task groups can be formed either by task orientation (same activity, e.g. laying cables), or location orientation (all activities in one place, e.g. command post). Location orientation is preferred wherever possible, to ensure the simplest possible structure and to reduce the coordination effort as much as possible.
All the jobs created in this manner were set, with a job description, integrated in organizational elements and then formed to platoons and companies. The new jobs and organization was approved by the Federal Ministry for Art, Culture, Public Service and Sport (BMKÖS). New jobs to establish and operate the TCN were introduced under the title Intelligence and Communications Technology NCO (ICT-NCO) and added to the respective organizational entity. The ICT-NCO will have a formative training role in the future. The most important changes in the structuring of the signal corps are listed below.

Organizational Level: Company (all types)

The TCN components assigned to the company (Bittium TAC WIN Tactical Router and Radio Head for frequency band I, LAN components, server) will be set up and operated by the new ICT NCO. The Radio NCO and his communication team will collectively form a radio data group.

Organizational Level: Battalion and Brigade

For all higher management levels, as well as for battle groups, the following organizational entities were derived for the battalion's ICT platoons, the land and air brigades' command support companies, and the command support battalions:

An ICT group for a command post from battalion level upwards (two professional soldiers, six recruits) with one

- Bittium TAC WIN Tactical Router (with main mass in shelter and with parts in transport boxes),
- two Bittium TAC WIN Radio Heads (NATO band I and III)
- server and
- LAN equipment according to the level of command.

A network radio group for network formation and connecting the Combat Net Radio (two professional soldiers, five recruits) with one

- Bittium TAC WIN Tactical Router (with main mass in the radio shelter),
- two Bittium TAC WIN Radio Head (NATO band I and III),
- Combat Net Radio (CONRAD) system.

An ICT construction team to make and maintain fiber-optic cables and copper cable connections (one professional soldier, five recruits) with one

- two-kilometer multimode fiber-optic cable,
- three-kilometer single-mode fiber-optic cable, and one
- four-kilometer field cable.

A C2V (command and control vehicle) (task unchanged; but now with ICT-NCO) with a

- Bittium TAC WIN Tactical Router,
- Bittium TAC WIN Radio Head (NATO band I),
- server,
- Combat Net Radio CONRAD and HF radio, as well as
- LAN equipment.

During task analysis, numerous weaknesses in the previous organizational structure were identified and remedied. For example, the number of personnel in the VHF/HF data radio squad was increased from three to four soldiers to be able to, at minimum, fulfil the basic mission.
The following organizational entities were introduced in the brigades' command support companies and in the command support battalions:
The Network Group with three network squads for interconnection into the fixed communications system, for building data radio relay formation, and network mashup (three professional soldiers, nine recruits), there is one squad each with

- a Bittium TAC WIN Tactical Router in transport boxes and
- two Bittium TAC WIN Radio Heads (NATO band III) or
- two Bittium TAC WIN Radio Heads (NATO band IV).

IT squad contingent: For special unit command posts (three professional soldiers) with one

- Bittium TAC WIN Tactical Router in transport boxes,
- server and
- LAN equipment according to the make-up of the special unit.

ICT- Electrotechnical Security & Energy Supply Squad: To ensure the implementation of the "Electrotechnical Safety" regulations and safeguard the energy supply.

Spectrum monitoring entity: To monitor the orderly, internal frequency usage, and to identify local anomalies (investigation).

VSAT squad: The VSAT (very small aperture terminal; satellite receiver and transmitter with antennas) is used to ensure multi-channel satellite connections for both domestic and international missions.

Training personnel: This personnel serves to provide training as part of the roll-out of the TCN within the given department, to cover the staff training while the TCN is in use and/or future digitalization measures.

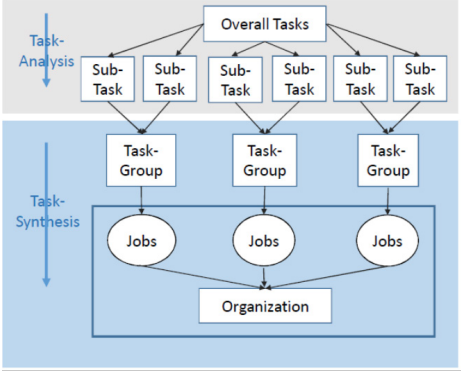

Figure 2. The schedule of the communications system upgrade in the long term (Illustration: Austrian Armed Forces)

The number of organizational elements listed above for the battalion's new ICT platoons, for the brigades' command support companies, for the air support, for the radar battalion, and the command support battalions is based on their basic tasks.

In addition, based on the task analysis, the S6 group battalion was strengthened and the S6 group brigade was restructured at time with the integration of network control element. The first organizational plans came into force on 1 March 2020. Further changes in organizational planning will follow in good time, to ensure the selection of personnel and training before the equipment is deployed.

TCN Equipment Provision

In deriving the number of components purchased, the stocks of reusable ICT devices (e.g. fiber optics, construction equipment, cables), the stocks of reusable shelters, and the new organization of the signalers, ICT device sets were developed with standard set lists and incorporated in the equipment table of the organization plan.

The "old systems" are generally made ready for TCN installation by the device owner (process steps 1 and 2); for deployable switching systems (process steps 3a and 3b) by the specified pre-fitting workshops; or, for armored combat vehicles and air surveillance systems (process step 4), by the internal preparation and installation workshops specified by the AAF, taking into account the project management plan agreed with the contractor. The associated "logistics process" is shown in the illustration (see Figure 3).

After delivery of the switching units or the installation of the TCN by the contractor, the assigned Austrian Armed Forces components will be added to the army logistics center in Wels, and the deployment systems will be delivered to the new owners.

The main criteria for the order of delivery are:

- No delivery during a preparatory phase for a foreign mission (lead brigade);
- Emphasis on TCN training for command support personnel in any phases without a deployment date;
- Consideration of the armed forces' major projects in 2021 and 2022;
- Preservation of flexibility of action and low impact in the event of delays in the course of provision or delivery of the systems.

Figure 3. The TCN logistics process (Illustration: Austrian Armed Forces)

At the same time, the projects connected with the TCN must be planned and implemented as part of the outfitting process (see Figure 4).

TCN Regulations

Regulations are required to ensure that the new devices can be used in the field. The implementation plan provides for the most important regulation "TCN planning and deployment". The first draft of which is due in July 2020 and is to be evaluated during the "teach the teacher" training program. A draft concept has already been drawn up.

TCN Training

After the first partial delivery in July 2020, the "teach the teacher" training will also be starting. Selected teaching staff from the command support school and the troops will thus be laying the foundation for the future TCN training program.
2021 sees the start of the "TCN retraining" for pre-qualified staff in the area of level-5 professional training, or the command support level-3 command organization entity, or in the sergeant-level course for communications staff, and in the starter course on data networks and IT security for specialist staff. The draft curricula for the courses were finalized at the end of May 2020 and will subsequently be updated on an ongoing basis, taking into account experience to date.

A state-of-the-art TCN training system (an integral part of the contract) and TCN organizational element equipment form further pillars of a successful training process. The inclusion of the TCN in officers' and NCOs' regular training, starting with level-2 prospective professional training, is planned for 2021/22.

TCN Infrastructure

The training facility in shelters at the command support school poses certain infrastructure requirements (foundation, connections). Minor adaptations are also required in the army logistics center to cope with the new tasks.
There are myriad other measures required, such as for example communications mechanics training, but providing an exhaustive list would far exceed the scope of this article.

Figure 4. Projects associated with the implementation of the TCN (Illustration: Austrian Armed Forces)

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Objective Target: Capability Increase

All in all, as part of the tactical command and control process, the TCN enables battalions to form a broadband command network that swiftly provides intelligence from sensors and troops, to commanders and staff, with cutting-edge technology at unit level. The time it takes until an operational network will be established at company, battalion, and brigade levels can be reduced significantly after an initial trial-by-doing phase.

At a Glance

The TCN will see the Austrian Armed Forces at the forefront of digital networking, nationally and internationally. If all departments involved push ahead with implementation within their area of responsibility as planned, there is nothing standing in the way of a successful roll-out of the new system. This means that from 2023, the troops could be working with the TCN.

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