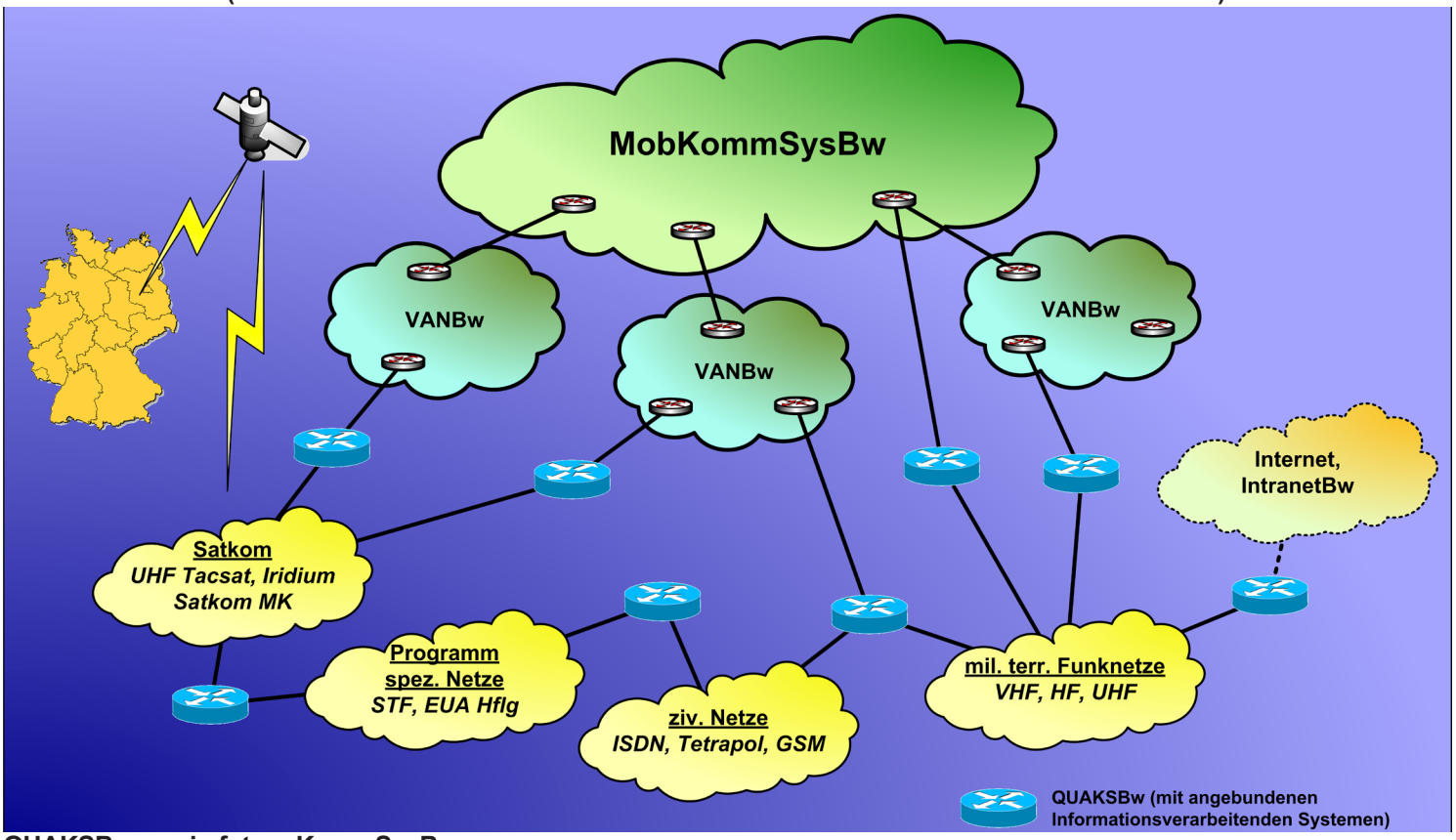
Network centric warfare with QUAKSBw

To meet the challenges posed by the increasing digitalisation of the battlefield in network centric warfare, a new system is needed to provide a backbone for tactical communication: QUAKSBw – "Querschnittlicher Anteil Kommunikationsserver der Bundeswehr" (Cross-Sectional Part of the Communication Server of the German Armed Forces).



QUAKSBw use in future KommSysBw.

QUAKSBw supports network centric warfare by acting as the essential link between various applications on the one hand and the expanded and heterogeneous pool of communication resources used in the federal army. Not only does QUAKSBw hereby provide data communication services; it also provides services for voice communication in analogue and digital form.

Based on contemporary internet standards such as IPv4 and IPv6, QUAKSBw can transmit voice and data at the same time, yet still independently of each other, and can also make optimum use of the transmission channels by implementing a quality of service model which can be customised as required.

Network topology can be ascertained automatically and reliably using tried and tested standard routing protocols which have been adapted for the heterogeneous range of communications. This means the forces have a highly modern communications switchboard at their disposal. In order to master the wide variety of different transmission resources and networks which need to be connected, modularisation and simple configuration are priorities. The defining of operation-based presets conceals the actual complexity of the system from the user.

By consistently separating the tactical management system (tactical domain) from the underlying technical communication structures (technical domain), a QUAKSBw network can be built up within the technical domain without being configured by an active application from the tactical domain. This network can communicate in its own right.

Within the technical domains, QUAKSBw creates a self-organising, mobile ad-hoc network by integrating transmission resources into a homogeneous, IP-compatible network. Using adaptive procedures, and dependent on the available bandwidth, this network automatically and dynamically re-calculates the basic routing tables.

In the resulting network topology, loss of single knots is registered and available alternatives are spontaneously exploited to compensate for such.

Clients from tactical domains register once with the local QUAKSBw to which they are assigned, which distributes this information via the communication network. This ensures clients are able to communicate with each other.

However, the resulting unlimited exchange of data between all clients that is thus theoretically possible is, in practice, restricted:

- narrowband circuits, for example, do not permit e.g. video streams,
- special tactical demands require networks to be reserved for special applications, and
- military priority levels have to be considered.

For this reason, QUAKSBw follows a “Quality of Service” concept, which takes a differentiated services (DiffServ) approach, based on the QENI concept (QoS-Enabled Network Infrastructure). This lists all requirements made to a certain transmission quality in one field, so-called “traffic classes”. As the IP protocol earmarks 6 bits for this field, a total of 64 traffic classes are theoretically possible.

The traffic classes are evaluated in the IP system of QUAKSBw. For this purpose, various topologies are constructed, based on the dynamically ascertained resources which are actually available, such as bandwidth, utilisation, costs etc., as well as network planning to be conducted as part of a multi topology routing. These topologies offer a variety of logical views of the telecommunication connections which are actually available. A topology which is suitable for transmitting video streams, for example, will thus not include any narrowband circuits such as VHF “Truppenfunk” radio. When an IP packet is sent, this packet is first assigned to a topology, and thus to a communication resource. If a number of packets have to be transmitted simultaneously by this communication resource, these will be put in order of priority according to their traffic class.

If it is necessary to enter a network which does not take the QUAKSBw’s QoS concept into account, a conversion is made to the traffic classes to be used there, or a tunnelling through this network.

Measures to optimise the transmission of information include, for example, the compression of IP header data, and where necessary also user data, or the use of transport proxies to increase efficiency in end-to-end communication over several heterogeneous networks.

The digitalisation of voice communications means it is possible to transmit both voice and other data virtually at the same time using the same transmission resource. By mapping the voice communications onto the traffic class to which they have been assigned, it is possible even here to prioritize. Whilst networks with sufficient bandwidth use standard Voice-over-IP (VoIP) technology, the transmission of digitalised language is optimised accordingly for narrowband circuits.

For transmission resources which are not sufficiently capable of dealing with digital voice transmission, QUAKSBw also supports analogue voice transmission. Importantly, this allows a transition between analogue and digital voice transmission.

For the transmission of data, both an email service tailored to military demands as well as transparent, IP-based transmission can be used. By using alternative path selection as well as the store-and-forward principle, the QUAKSBw email system is extremely resistant to changing topologies. Special email elements (“X fields”) enable mails to be assigned to the desired traffic class, thus defining the requested transmission quality.

The complex structure and functionality of QUAKSBw mean that stringent management is necessary. Based on the principles of

- consistently separating technical domains and tactical domains,
- minimising interfaces between QUAKSBw and the applications used,
- and simplifying processes by automation wherever possible and reasonable,

the following interfaces have been provided for management:

- An HTML user interface. This contains all functions needed for the complete execution of operation and configuration.
- An SNMP-based network management interface. This provides functions for superordinate network management.
- A command interface. This allows QUAKSBw to be controlled via XML service messages through applications used, in the required scope.

All parameters, which have to be defined on a cross-functional basis, are determined by the hierarchical network planning and made available via configuration sets. Local configuration is thus reduced to simply installing the configuration sets and selecting the relevant presets. The necessary administration of QUAKSBw is thus simplified.

IT security aspects play an essential role in QUAKSBw. By consistently implementing and testing measures, integrated software security is ensured (Security by Design). In particular, ATM takes the following measures in order to provide basic IT protection in accordance with ZDv 54/100:

- implementation of a user-role concept to control entitlements for access and entry,
- certificate-based authentication for enabling entitled access,
- implementation of an intrusion prevention / intrusion detection system,
- implementation of data transmission protection through cryptology (IPsec).

With QUAKSBw, the German army has a highly modern communications switchboard at its disposal which builds on experience with the KommServerBw system, and taken on established procedures and functions. Over and above this, QUAKSBw is combined and upgraded with new features.

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