

## Distributed voice and data radio communication systems for coastal marine VHF+AIS with secure IP-based access

Based on in-house cryptographic research and original secure data communication system architecture with custom public key infrastructure (PKI) and remote configuration management, Cybernetica has designed, developed and deployed two IP network centric communication and monitoring systems for application within the Estonian marine navigation safety infrastructure.

According to best practices of developing e-solutions, these systems make extensive use of off-the-shelf hardware and open source software to guarantee a short deployment phase and trouble free life cycle support. Key factors guaranteeing open architecture approach, reliability, security, and optimal life cycle costs include the use of following:

- Standard VHF radio transceiver equipment (Sailor / Thrane)
- Standard protocol for transceiver control (SparcBus by Thrane)
- Hardware platform: x86-compatible industrial PC's
- Sound processing: standard sound cards, pre-tested and approved
- Reliable and secure software platform: Linux, redundant servers
- Site LAN: standard network routers, switches, etc
- Secure tunneling through public IP networks (built-in VPN and PKI)
- Built-in test equipment (BITE), remote diagnostics and system status statistics
- Standard databases for recording of time stamped voice and traffic data
- Automatic recording of all sound and data messages
- Operative and database based replay features
- Selection of various audio interfaces for operator convenience
- Interfaces to other communication networks (PSTN, TETRA, etc)
- Open system architecture – standard AIS transponders are supported
- Support to single or multiple operator centres, no distance limitations
- Automatic selection of a radio transceiver station providing best reception and transmitting quality for the actual connection
- The number of operator workplaces is restricted only by customer needs
- All operators can use all stations and any available radio channels

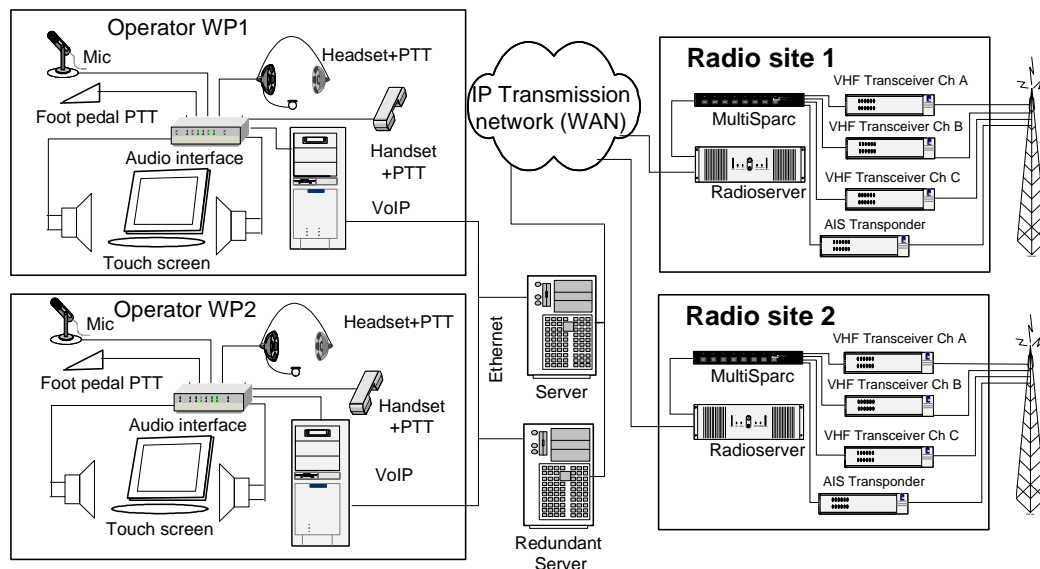


Figure 1. Simplified diagram of a VHF for VTS system with two radio sites

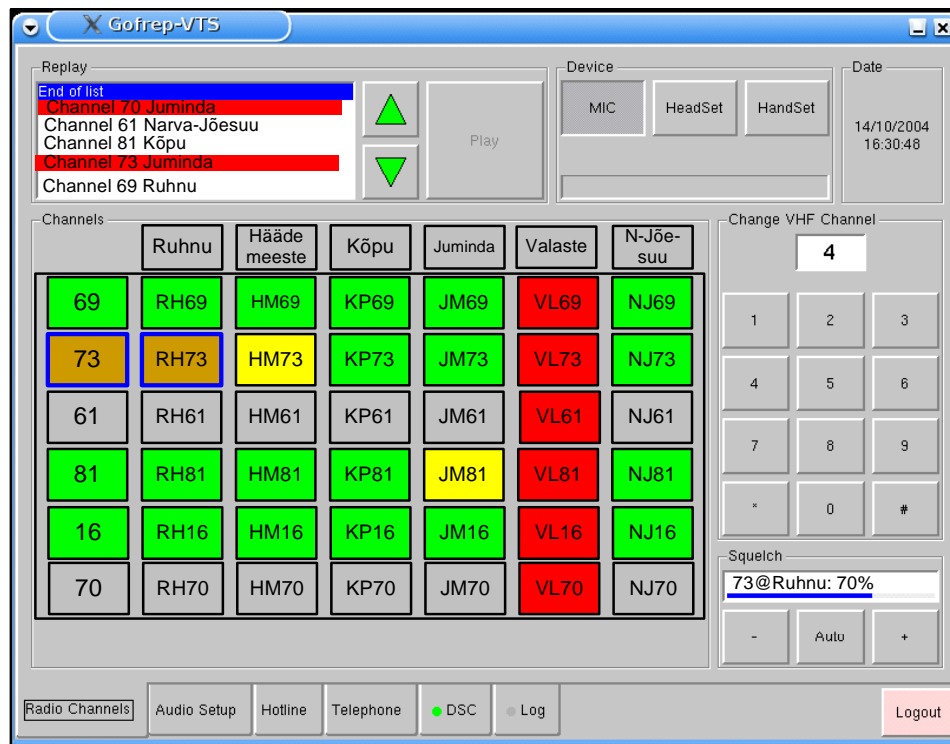


Figure 2. User interface of the VHF for VTS radio operator software application.

The user interface of the VHF for VTS software application is intuitive and simple (Figure 2), providing necessary user authentication and access rights management. Up to 6 radio transceivers can be installed at any remote radio server site. The VHF/AIS basestation with radio server is housed inside an environmentally protected 19' stainless steel rack.

The system can be customized for application in solutions other than marine VHF/AIS communications. Main feature of this IP based communications solution is provision of technology to enable use of established radio communication infrastructure by multitude of users, possibly from several relevant organizations, allowing to reduce and share costs.

#### Current applications:

- VHF for VTS system (Tallinn, Estonia) – a marine VHF radio communication system with secure wide-area computer network (IP) based access to the countrywide network of computer controlled radio stations for provision of data and voice call communication capabilities between Vessel Traffic Service (VTS) Centres and vessels (ships within the coastal area of coverage); provides a database for recording of voice and data messages, DSC (Digital Selective Calling) and AIS (Automated Identification System) capabilities;
- GoFREP (Gulf of Finland Reporting System) - a vessel traffic monitoring and reporting system for the Baltic Sea countries (VHF+DSC+AIS, 8 sites covering the northern coast of Estonia).

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