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Radiomonitoring System R&S®RAMON

Communications intelligence – systems that adapt to growing requirements

With its R&S®RAMON product family, which consists of systems for radio-monitoring and communications intelligence, Rohde & Schwarz set the course towards modularity and scalability early on. The latest generation is now available.

Flexibility due to optimum scalability

From an operational point of view, the scalability of radiomonitoring systems is gaining increasingly in importance. Owing to their modularity and scalability, the R&S®RAMON systems permit the following:

- ◆ Depending on the current mission, the systems can be adapted and reconfigured to comply with different tasks
- ◆ They can be easily expanded and upgraded to meet new and changing requirements
- ◆ Interfaces allow integration in an architecture the user already has with a minimum of effort
- ◆ The systems are remote-controllable

R&S®RAMON systems were designed for government authorities with security missions and the armed forces; they support the following tasks:

- ◆ Military missions as part of the UN peacemaking and peacekeeping missions (e.g. reconnaissance via fact-finding teams or protection of one's own forces)
- ◆ Information procurement as a basis for political decisions
- ◆ Combat of trafficking and illegal border crossing
- ◆ Protection of property and personal protection

System architecture

R&S®RAMON systems consist of sensor and IT components, various units of the radiomonitoring and radiolocation portfolio from Rohde & Schwarz, plus the R&S®RAMON system software as a user interface. The software permits:

- ◆ Direct control of the units that are connected to the controller
- ◆ Storage and evaluation of the data obtained

More information and data sheets at www.rohde-schwarz.com (search term: RAMON)

REFERENCES

- Technical Information R&S®RAMON
- Technical Information R&S®TMSR (available on request)

- ▶ ◆ Controlling and monitoring of the information flow in a networked system with several workstations or system locations

Special software modules are available for each of these tasks. FIG 2 shows the different modules and their integration in the information flow within a system. Depending on the size and type, the systems contain individual or several of these modules.

Development of the software modules is based on components, i.e. the modules are assembled from individual small software function units, offering users

the great benefit that the graphical user interfaces for widely different units are identically designed throughout, making it easy to cope with diverse units.

Due to this component-based development, numerous open interfaces become available as well, which can provide the basis for the integration of the R&S®RAMON software into existing systems.

The software architecture permits the remote control of units, subsystems or entire radiomonitoring stations. For this purpose, the client/server architecture, which is the basis of every device

control, offers an interface between the device driver and the user interface. The TCP/IP-based communication link between these two software parts can be set up both on a controller within a local area network (LAN) and via a wide area network (WAN).

The R&S®RAMON software also allows integration of Rohde & Schwarz equipment such as the following:

- ◆ Receivers R&S EB 200® / ESMB / ESMC / EK 895 / EK 896
- ◆ Direction finders R&S DDF® 190 / DDF® 195 / DDF® 0xA / DDF® 0xE / DDF® 0xM
- ◆ R&S AMMOS® systems for HF and VHF / UHF

Operational concept

Communications intelligence is a step-by-step process in which radiocommunication signals are intercepted, ana-

lyzed, stored and evaluated. This process is generally referred to as intelligence cycle. R&S®RAMON systems map

this process by means of different software modules. FIG 1 shows a simplified process.

The operation of larger systems with several workstations is usually organized by a supervisor who plans the interception tasks on the basis of a customer order. By means of the ReportEdit software module, specific tasks (orders) are assigned to the individual operators. The operator transfers the interception results (data, audio) by means of a mouse click to the reports and sends them to an evaluation workstation. The evaluator in turn stores the results of the tactical and operational evaluation to an Oracle-based database. The supervisor accesses this data, generates messages for the customer as well as new orders that include the findings thus obtained.

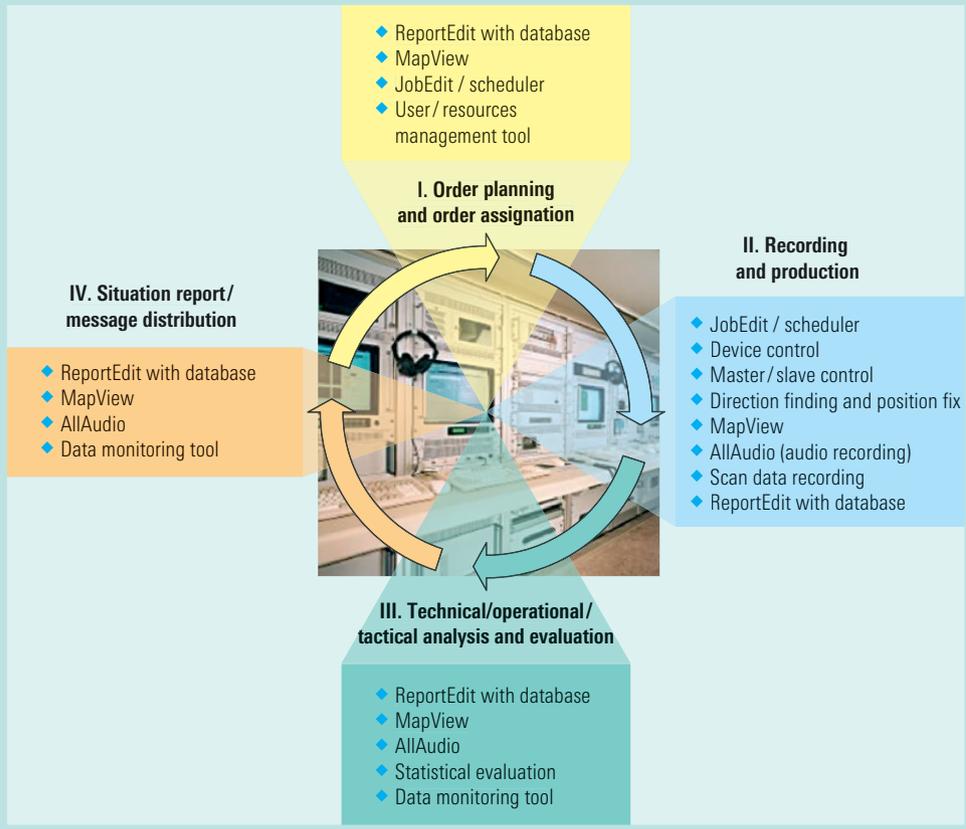


FIG 1 Intelligence cycles in R&S®RAMON systems.

System examples

The following two examples illustrate the scalability of the systems from the R&S®RAMON family.

Tactical Interception and Direction Finding System R&S®TMSR

Compact, highly mobile systems for electronic support measures (ESM) are required for international out-of-area missions, in particular for:

- ◆ Generation of a situation picture
- ◆ Onsite protection of one's own forces
- ◆ Support and complementation of stationary radiomonitoring systems

The R&S®TMSR consists of a search receiver, a direction finder and a laptop computer with the associated R&S®RAMON software (FIG 3). Owing to its modularity, the system can be adapted to changing tasks:

- ◆ As a manpack system, consisting of the R&S EB200® receiver and the Active Directional Antenna R&S®HE 200; portable by an operator during operation, e.g. for the localization of miniature transmitters (homing)
- ◆ As a portable system, consisting of the R&S EB200® receiver, the Active Directional Antenna R&S®HE200 and a laptop computer (this assembly

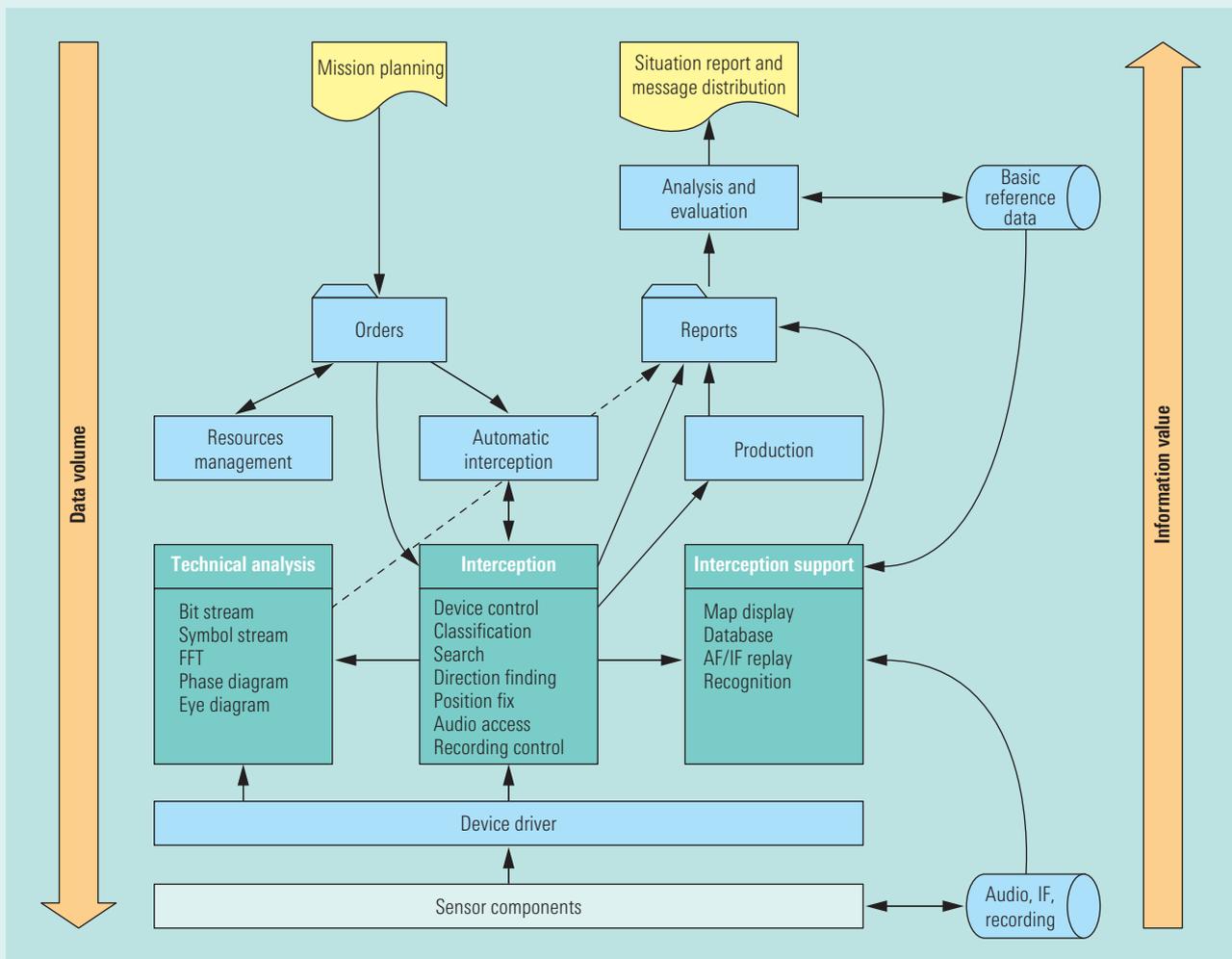
already forms a functioning interception system, e.g. for covert reconnaissance)

- ◆ As a fully transportable system with a direction finder in the transit case, e.g. as a compact mobile interception and DF station

Remote-controlled radiomonitoring with semi-mobile systems

It is often necessary to monitor radio-communication in remote areas without setting up the necessary infrastructure onsite and providing highly qualified personnel. For this purpose, a number of unattended remote systems for radiomonitoring and direction find-

FIG 2 Modules and their interaction in R&S®RAMON systems.





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FIG 3 The R&S®TMSR with a detachable R&S EB 200® receiver for manpack operation.



FIG 4 Semi-mobile radiomonitoring and direction-finding station – ready for transport.

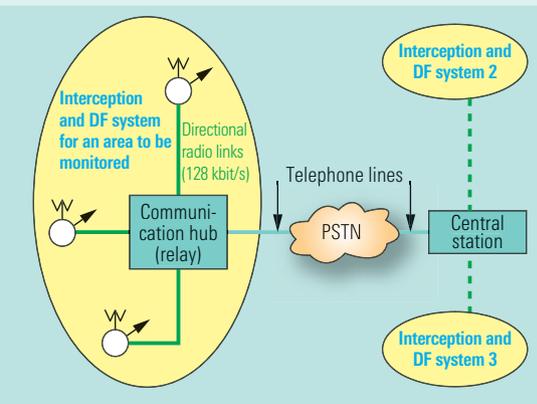


FIG 5 Configuration example of a remote-controlled interception / DF system.

ing can be remote-controlled by a central interception and evaluation station. Since the areas to be monitored can frequently change, the systems are fitted into cabins and quickly transported to their new sites by means of trucks. FIG 4 shows a radiomonitoring cabin that is mounted on a truck.

Such stations can be quickly set up, even by personnel not familiar with radiomonitoring. Operation in this case is from a radiomonitoring central station, which can either consist only of operator workstations, or it can be equipped with a radiomonitoring system of its own (receiver, direction finder). The central station is either accommodated semi-mobile in a shelter, or the units are integrated in portable transit cases so that they can be set up in a building or tent, for example.

FIG 5 shows a possible system configuration. The communication means used for data communication between radiomonitoring / DF stations are modems for analog dialled or leased lines and directional radio systems.

Additional relay stations (also semi-mobile) are offered to increase the distance between the radiomonitoring and DF stations and the central station, particularly for the use of directional radio systems.

The software permits resource management, i.e. the resources required for a specific task are selected by an authorized operator (supervisor) in the central station from the total available resources and temporarily assigned to one of the operator workstations. The entire system can be quickly rearranged, both on the hardware and software end, if the focus of the task changes.

External interfaces

R&S®RAMON systems are modular and flexible: To avoid having to renew the entire system when replacing parts of an existing interception system, users can also integrate individual system modules in existing systems, as in the following two examples:

Device control

The R&S®RAMON modules for device control have been optimized for fast operation, taking into account the requirements placed on military radiomonitoring systems. The capability of simultaneous, concurrent operation, i.e. either directly on the unit or via the graphical user interface of the controller, adds to the flexibility. The operators can optimize the settings of their receivers directly on the unit during the drive in an off-road vehicle, while at the same time keeping an eye on the result display of the control software on a TFT display of the controller.

FIG 6 shows the user interface of two radio receivers that are operated as search and handoff receivers, coupled with each other.

The modules for device control offer an external CORBA interface¹⁾, via which they can be conveniently included in other systems. For example, individual radio receivers or direction finders, together with the R&S®RAMON module for device control, can thus be integrated in external systems.

Data flow in the system

The ReportEdit software module is used to generate orders and reports. It generates files in XML format²⁾ which are transmitted between the individual workstations and / or systems. An Oracle database stores the contained data. The reports include measurement data, links to recorded signals and screenshots of the current situation picture on a digital

map. Units (e.g. receivers / direction finders) can also be directly controlled from this form. Users can easily modify or recreate the screen masks (FIG 7). This mechanism offers them the capability to provide R&S®RAMON-based workstations / systems with orders as well as to obtain result data from the system and process it further by means of their existing evaluation software.

Summary

With its R&S®RAMON systems for communications intelligence, Rohde & Schwarz offers a variety of individual system components up to turnkey systems. The individual modules can be conveniently combined according to customer and task to form tactical or strategic interception systems. In conjunction with services such as advice prior to procurement, installation, training, support of onsite operation and system maintenance, Rohde & Schwarz provides its customers with tailor-made all-in-one solutions from a single source.

Jürgen Koppitz

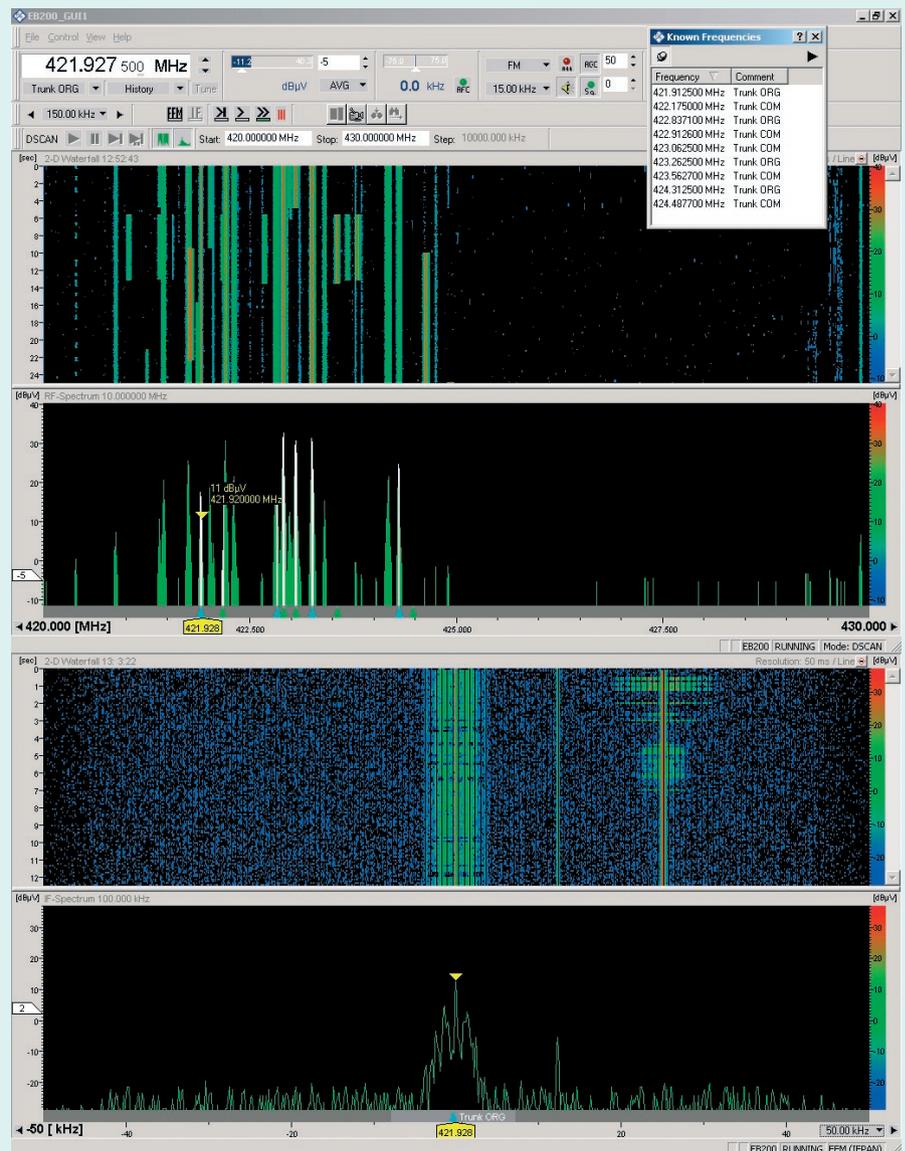
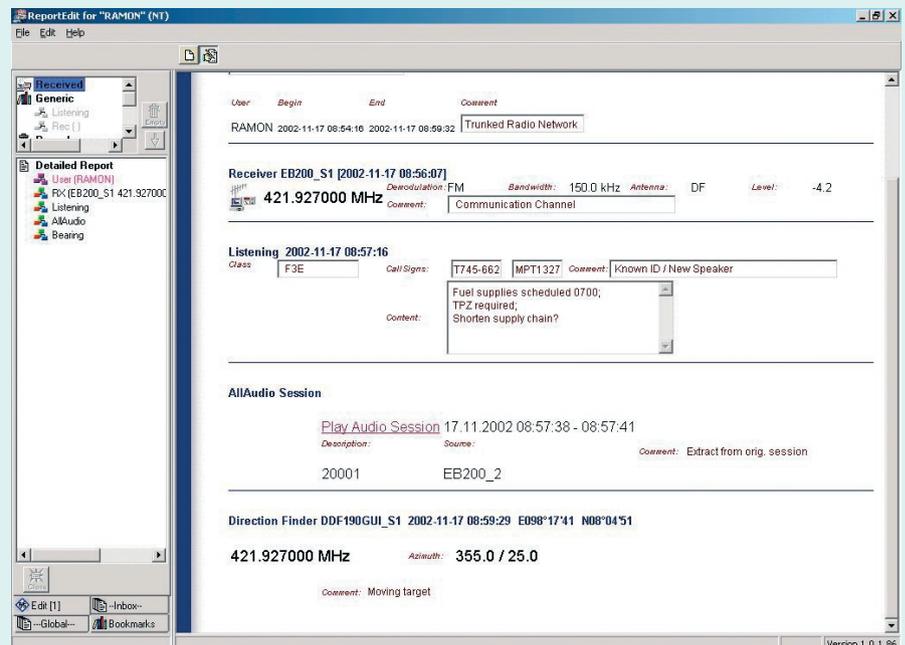


FIG 6 User interface of the search receiver with HF spectrum / waterfall (top) and of the handoff receiver with IF spectrum / waterfall (below).

FIG 7 Screen mask of the monitoring results in the ReportEdit module.



- 1) CORBA: common object request broker architecture; a standard interface for data exchange that is independent of both platform and operating system.
- 2) XML: extensible markup language.