

System that grows with you



Multirate Multiservice Microwave Node for Next Generation Networks, operating from 7 to 23 GHz

- SparkWave SDR HSP: High Speed PDH
- SparkWave SDR STM: SDH STM-1 terminal
- SparkWave SDR ADM: SDH STM-1 add/drop

SPARKWAVE
digital microwave radio



The SparkWave SDR Family

SparkWave SDR has three family members:

- **SparkWave SDR HSP** is intended for PDH signal transmission and Ethernet transmission in various combinations. The upper transmission capacity limit is 152 Mb/s or 72xE1 equivalent.
- **SparkWave SDR STM** is SDH terminal radio, intended for point-to-point STM-1 signal transmission.
- **SparkWave SDR ADM** is SDH STM-1 radio with an add-drop multiplexer and 2,5 Gb/s crossconnect matrix. It is intended for a chain or ring topology.

Operating frequency ranges are from 7 to 23 GHz.

In the last few years network operators are facing rapid growth and fast migration from TDM to packed traffic. The main challenge is how to optimize investments and reduce maintenance costs.

Network operators are quickly developing and new broadband services are being introduced.

The transition from legacy circuit network to high-speed packet network is proceeding very smoothly and new equipment must support both technologies.

New telecommunication market players need low entry and operational costs,

but scalable equipment in order to assure future development. The new generation of transmission equipment must assure functionality of multi-service nodes with a possibility for easy adaptation to new network topologies and transmission capacities.

The new generation of radio-relay systems must be optimized for very different propagation conditions. In the case of excellent channel conditions, spectrum economy is usually more important and enables saving license frequency fees.

Iskra Sistemi response to this challenge is the SparkWave SDR.

System description

SparkWave SDR is divided into two parts: Indoor Unit - IDU and Outdoor Unit - ODU with Antenna.

Both parts are connected via a single Coaxial Cable. The IDU is independent from the transmission frequency and the ODU is independent from the transmission capacity.

The quality and availability of the link, required to comply with ITU-R recommendations, can be achieved with simple 1+0 configuration or various 1+1 configurations (Hot Stand-by, Frequency or Space Diversity).

Indoor Unit - IDU

The IDU is built into the chassis, which can be 1U or 2U high. In the case of 1U, only the central module and radio module can be plugged in. In the case of 2U, additional place for tributary modules extension and for a radio module protection is available.

The central module is the core of device. Changing the central module enables transition from PDH to SDH or from STM to ADM device.

Central Module for High Speed PDH - CMHSP

The CMHSP module enables tributary signal multiplexing, local and remote management access, protection switching, mapping/demapping of eight E1 and two Ethernet signals. Four positions are available for additional tributary units. Any combination of E1, E3 and Ethernet signals is possible.

The upper capacity limit for all multiplexed tributary signals is 152 Mb/s (72xE1 equivalent).



Benefits

- **Price effective solution.** Modular system design, flexibility, scalability and low maintenance cost offers price effective solutions to any customer; demand-based pay-as-you-grow .
- **Reducing the maintenance cost.** Due to high MTBF practically no troubles during a device's life span is expected. Nevertheless, the device is software defined and, as a result, very little spare parts are necessary for maintenance.
- **License fee saving.** Spectral efficient modes of operation (for example 64 or 128 QAM) enable saving on license frequency fees.
- **Scalability.** Transition from PDH to SDH or from STM to ADM only needs a change of the central module.
- **Increasing transmission capacity.** SDR technology enables system upgrades by remote download of new software. By changing the software and (if necessary) adding new tributary modules it is possible to increase transmission capacity.
- **Transition from circuit to packet transmission.** The system enables smooth transition from circuit transmission mode to packet transmission mode (Ethernet).
- **Simplified installation.** A single cable connection between outdoor RF module and indoor system module simplifies system installation.
- **Network Element Management system** is entirely built into the radio device. No additional equipment is needed except a standard computer with built-in Internet browser. For this reason, the system is not sensitive to commonly-know weakness of the proprietary management software, such as the necessity for software upgrades after any change of the management system specification.

Features

- **Software Defined Radio - SDR** enables software selection between various physical transmission modes. It means that different levels of transmission robustness or spectral efficiency can be software selected. Long transmission paths can be established by selection of more robust physical operation mode. In the case of excellent radio channel conditions, one of the spectral efficient modes of operation can be selected.
- **SparkWave SDR ADM** enables add-drop multiplexing with a 2.5 Gb/s non-blocking cross connect matrix, various tributary units and ESSI extension bus.
- **SparkWave SDR HSP** (high speed PDH) enables transmission capacity up to 152 Mb/s (equivalent of 72xE1) +service channel and even exceed the capacity of synchronous STM-1 levels.
- **Various tributary signals:** E1, E3, STM-1, 10Base-T/100Base-TX Ethernet and Gb Ethernet can be software selected. They can be transmitted in almost any combination. The only limit is, that the overall transmission capacity does not exceed 72xE1 equivalent in PDH or STM-1 in SDH.
- **Modular system design** enables construction of various devices - PDH and SDH only by combining a central module, tributary modules and radio module in an 1U or 2U Chassis.
- **Various protection schemes** are available: Hot Stand-by (HSB), frequency or space diversity (FD, SD) with hitless switch and the combinations of them.
- **Built-in management system.** The IP switch, SNMP agent web server, built into the device, enable management of network elements from any geographic point without the need for any special computer software.

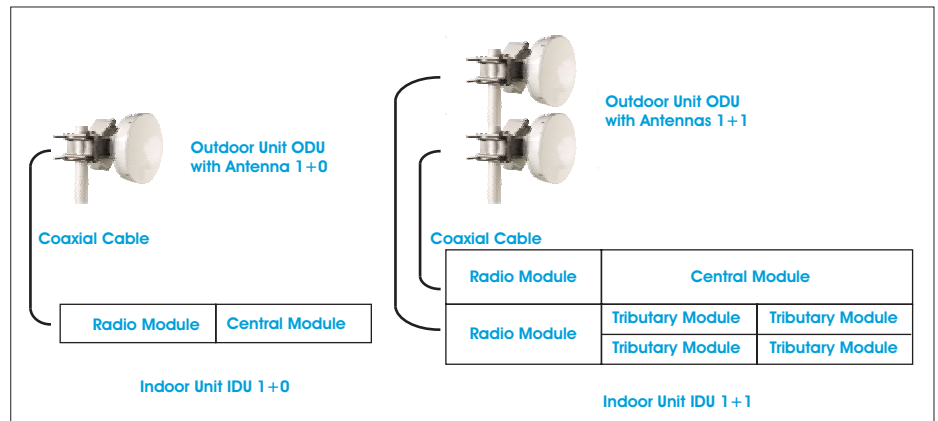




IDU with HSP central module, tributary modules and radio modules, 1+1

The Central Module for SDH STM-1 - CMSTM

CMSTM module enables STM-1 signal transmission. The tributary interface can be optical or electrical. Different configurations are available: 1+0, 1+1, 2+0 or 1+1 FD with low priority traffic transmission.



SparkWave SDR in 1+0 and 1+1 or 2+0 configuration



IDU with STM central module

The Central Module for SDH ADM-1 - CMADM

CMADM enables cross connecting of line signals, tributary signals and signals from the extension bus. Additionally, it enables the mapping of eight E1 and six Ethernet signals, local and remote management access, protection switching. Four positions are available for additional tributary units. When more interfaces are required, an additional device can be connected to extension bus.

Radio Module - RM

Software defined RM defines one of the physical (PHY) modes of operation. Various PHY modes of operation are available, depending on the radio channel characteristics that require transmission robustness or allow spectral efficiency:

- MQAM modulation, where M can be 4, 16, 32, 64 or 128
- FEC (Forward Error Correction) using various coding schemes: Reed-Solomon Block Coder, Convolutional Coder, Pragmatic Trellis Coder with Viterbi Decoder or Block Convolutional code.

The radio modem also enables adaptive channel equalization, which can improve system performance in frequency selective fading at a higher transmission capacity and high-level signal constellation.

Tributary Modules - TM

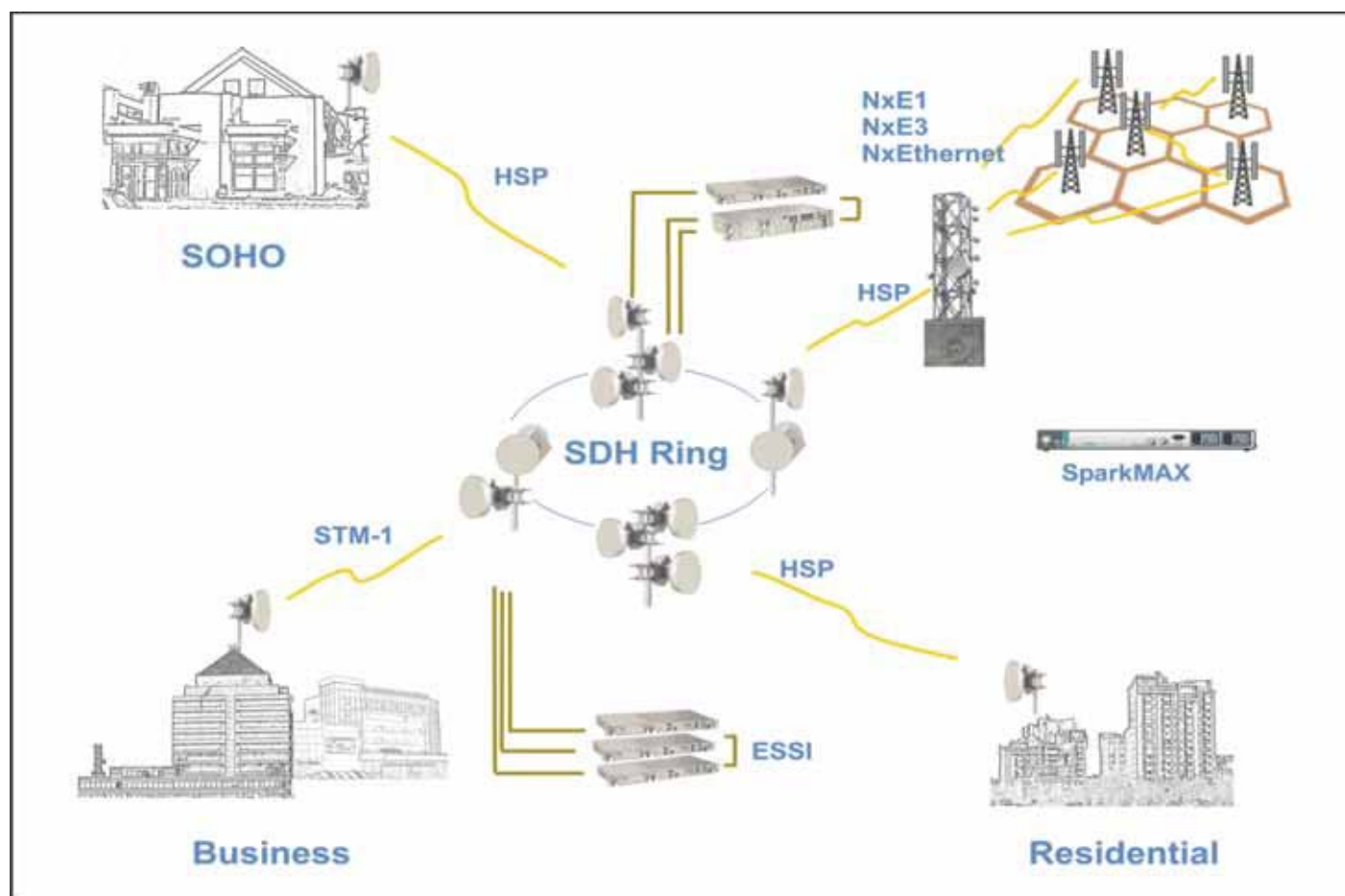
TM modules enable various tributary signals extension possibilities.

RF Part

The RF part contains the Antenna and Outdoor Unit - ODU. Both are bound together in compact block. Another possibility is separate fastening of the antenna and ODU to the antenna mast. In this case, a short flexible waveguide will be used for the connection. All-indoor (IDU and ODU) construction is also available for lower frequency ranges: from 7 to 13 GHz. In that case, the RF module will be connected to antenna by an elliptical waveguide.



Application



Various applications

The SparkWave SDR family can be applied anywhere, where quick installation, flexible and cost effective solutions of telecommunications problem are needed. It can be used in various applications:

- **Backbone links** for operators or private corporate networks
- **Stand-by links** for the main optical route protection

- **Temporary connections**
- **Disaster recovery** network
- **Base station connection** of cellular mobile network or for access network.

SparkWave SDR ADM can be applied in ring or chain topology, where path protection is necessary - as example for backbone or core network.

SparkWave SDR HSP enables high capacity point-to-point connection of various customers: rural, residential, SOHO, and business are some of examples.

Simultaneously with E1 signal synchronization can be transmitted.



Supervision and Management

The Element Management system (EMS) software is built into the radio device. No additional equipment except a standard computer with built-in web browser is needed.

GUI management using www downloadable EMS application.

Use of a computer with an Internet browser is the most efficient way for device network element management. The radio device has built-in HTTP server.

After computer login to the device server, the EMS software with graphical user

interface (based on JAVA technology) is automatically downloaded to the computer. Windows presenting built in units, device states, alarm tables and measurement graphs are available; the device is easily managed this way. The SNMP protocol is used for communication between the EMS and the device.

Command Line Interface (CLI) management over telnet

Remote file management via HTTP

Third party SNMP based management system integration.

SNMP protocol and public accessible MIB database enable direct equipment integration to any third party SNMP based management system.

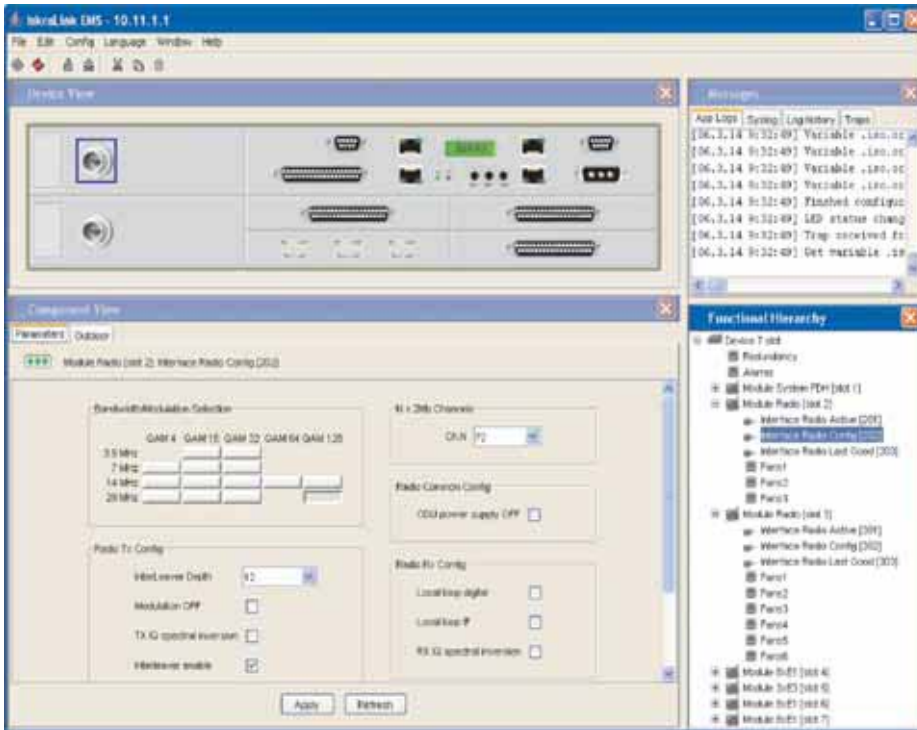
CLI over VT-100 terminal console connection

Status monitoring and configuration using LEDs and LCD display LCD display

Management by Iskra Sistemi SparkView NEMS Iskra Sistemi NEMS is state-of-the-art network element management system for complete management solutions.

Built upon three-tier client-server-network architecture it provides features like centralized SQL management database, support for statistics management, performance management, configuration management, user management, fault management and alarms management.

Incorporating technologies like JAVA, RMI, HTTP provides operators and administrators with powerful graphical user interface for efficient management of entire network of devices. Clients can connect to central server from any computer with built-in web browser.



Integrated management