SPECTRUM SIGNAL PROCESSING BY VECIMA

Embedded Radio Module for SATCOM Backhaul Applications

Product Concept

flexComm

A low power embedded radio module based on reconfigurable system-on-a-chip (SoC) technology that enables cost-effective wireless communications between deployed radio systems and central infrastructure systems over UHF SATCOM networks.

Your Challenges	Spectrum's Solution
Do you face any of these challenges developing a combat net radio for operation in a tactical environment?	Spectrum's embedded radio modules can be tailored for your SATCOM Backhaul applications and can help you to overcome your challenges:
• You need to connect your tactical terrestrial radio network to a SATCOM backhaul system, and you have an RF front-end for your SATCOM system	• Single card "IF-to-Ethernet" solution: Bridges your existing RF front-end with an IF frequency of 70 MHz (software reconfigurable) to your battlefield radio's Ethernet or other payload data interface to support backhaul communications at up to 2 Mbps
• You need to connect your tactical terrestrial radio network to a SATCOM backhaul system, and you need an RF front-end for your SATCOM system.	• Single card "RF-to-Ethernet" solution (optional): Utilize the embedded radio modules as a wireless adapter operating in the military Ultra High Frequency (UHF) (225 – 400 MHz), L-Band, Ka-Band, or X-Band frequency range. Insert this transceiver into your radio design and connect to your existing power amplifier and antenna assembly to support backhaul communications
• You have significant constraints on size, weight, and power	• The single board radio module is designed to draw less than 15 watts combined for RF, IF, and baseband signal processing
• Your platform needs to operate in a harsh environment	• Operate at temperature ranges from -40 to 70 degrees C and altitudes of up to 40,000 ft with shock and vibration tolerance
• You need to reuse existing waveform application code	• Spectrum includes integrated tools that significantly simplify porting of code to the backhaul system
• You need heterogeneous processing capability, including FPGA, DSP and General Purpose Processors	• The embedded radio module includes Xilinx® FPGA™ and a PowerPC general purpose processor (GPP) running an OS at 400 MIPS and an optional DSP running at 8000 MIPS
• You have custom RF, processing, I/O or software requirements that cannot be met by traditional COTS suppliers	• Modular hardware and software architecture that can be rapidly customized to meet your specifications in as little as 90 calendar days
• You need critical waveform components to make your application work	• The solution can be tailored to include components specific to UHF SATCOM DAMA Waveform including OQPSK modulator/demodulator, a convolutional encoder and a Turbo decoder

Description

Spectrum's embedded radio module technologies can be tailored specifically for SATCOM Backhaul applications, such as Combat Net Radio (CNR). Based on Spectrum's MILCOM reference designs, Spectrum can design a single card solution to support black-side (RF-to-Ethernet) digitization and processing of complex waveforms requiring low latency deterministic operation to maintain synchronization on a time synchronous network (see Figure 2). The solution can be conduction-cooled for rugged configuration, support a single IF input/output channel, an internal or external 10 MHz reference or high-speed sample clock, Gigabit Ethernet, RS-232 and JTAG connectivity. The rugged configuration is size, weight power and cost optimized for production deployments in harsh environments.

For details on other embedded radio module options, please refer to the SDR-4800 family datasheet at www.spectrumsignal.com/products/soc/sdr_4800.asp.

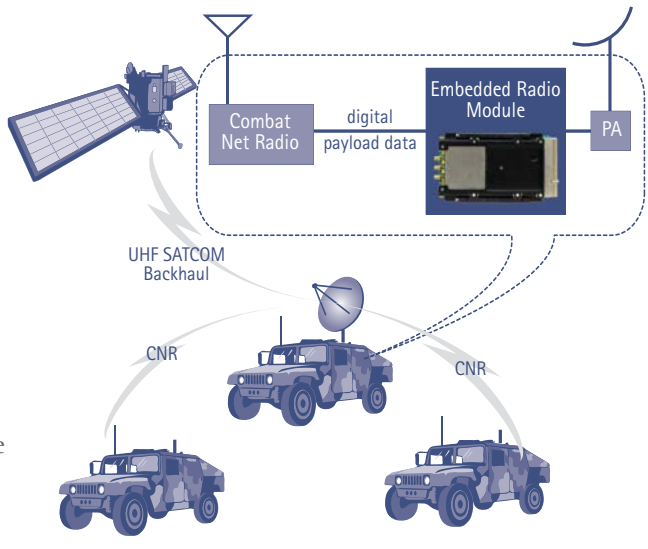

Figure 1. Concept of Operations

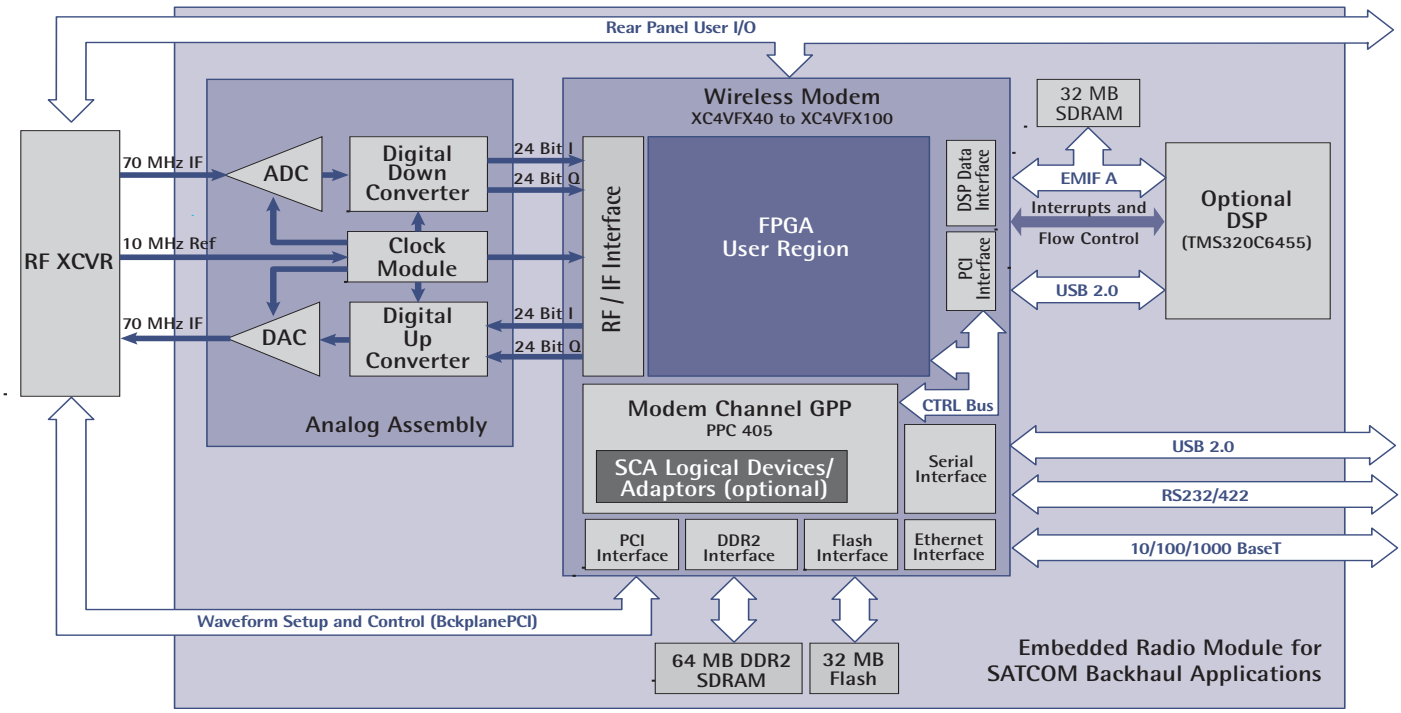

Figure 2. Block Diagram (IF-to-Ethernet and DSP variant)

Specifications

[General]

- IF Conversion and baseband processing:
  A single channel (1 in/1 out) embedded radio module
- Modem FPGA Processor:
  Reconfigurable System-on-Chip (SoC) built on Xilinx Virtex-4 FX40 to FX100 technology and incorporating an on-board modem general purpose processor (PowerPC 405), a partial reconfigurable user FPGA region, and a complete set of modem peripheral interfaces including a DigRF compliant RF/IF interface. Virtex-5 FXT upgrade available as a future option.
- DSP Processor:
  Texas Instruments 720 MHz TMS320C6455 processor with 32 MB SDRAM
- External Reference Oscillator: 10 MHz 0.5 – 0.9 Vpp (-2 to +3 dBm) drives sampling clock
- Internal Reference Oscillator: 10 MHz drives sampling clock
- External Sampling Clock: Supports range of 36 MHz to 300 MHz

[Buses]

- Host (Optional): 3U cPCI bus (32-bit/33 MHz)

[Analog I/O]

- High-Speed ADC: LTC2249 analog-to-digital converter operating at 80 MSPS in conjunction with a GC5016 digital down converter
- ADC Input: AC coupled, full scale 0.7 Vpp into a 50 ohm load, 3 dB input bandwidth: 63 to 77 MHz
- High-Speed DAC: AD9786 operating at 140 MHz
- DAC Output: AC coupled, max 0.62 Vpp into a 50 ohm load, 3 dB output bandwidth: 63 - 77 MHz
- Jitter: Less than 800 femtoseconds additive jitter through the analog clock distribution circuitry
- Low-Speed ADC: Quad 12-bit @ 100 KSPS
- Low-Speed DAC: Dual 12-bit @ 100 KSPS

[External Interfaces]

- Ethernet: Gigabit Ethernet (10/100/1000 BaseT)
- Low Speed Serial: RS232 data
- Analog Input: 1 channel, SMA connector, 50 ohms
- Analog Output: 1 channel, SMA connector, 50 ohms
- External clock/reference: 1 input, SMA connector, 50 ohms
- User I/O: GPIO lines between modem processor and J2 (see General Purpose I/O section of the SDR-4800 family datasheet)
- JTAG Connection: Flex cable to header

[Software Operating and Development Environment]

- Please refer to the software section of the SDR-4800 family datasheet

[Electrical]

- Supply Voltage (DC): +3V ±3 % and +5 V ±3%
- Power Estimate: Spectrum's embedded radio modules consume approximately 15 watts, including RF and FPGA processing. Further power reduction is possible through customizations such as: optimizing RF front-end performance; enabling sleep modes; utilizing lower power Virtex-5 technology. Final power consumption will depend on application requirements.

[Mechanical]

- Size: 100 mm (height) x 160 mm (length)
- Environmental Temperature: Conduction-cooling card edge temperature range of -40 to 70 degrees C
- RoHS: 5 of 6 compliant. For other RoHS options, please contact Spectrum Sales.

[Ordering Information]

- This is a product concept based on an application reference design. Please contact Spectrum Sales to determine the configuration and performance that best matches your application.
- For more options available with the Embedded Radio Modules, please refer to the SDR-4800 family datasheet.

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