Incorporating BGAN capability on SDR platforms has never been easier!

The GateHouse BGAN waveform for SDR is a complete waveform for the Inmarsat BGAN satellite system.

By using the GateHouse BGAN waveform, terminal/radio manufacturers will have the ability to incorporate BGAN capability (BGAN, Fleet Broadband, Swift Broadband, in the following just referred to as BGAN) on their SDR platform with a minimum of effort. The BGAN Waveform is based on the proven GateHouse BGAN Protocol Stack, which has been incorporated in a large number of BGAN terminals from several suppliers. The waveform was SCA certificated by Department of Defence, Joint Tactical Networking Center in year 2013. The SCA compliant BGAN Waveform will easily work with SCA compliant hardware and form a complete radio for land, maritime or aeronautical use. The waveform is designed for military as well as civilian use.

Technical description
The radio will be built from two main components:
• A SCA compliant platform
• The GateHouse BGAN waveform

The customer can use their own SCA platform containing the hardware platform, including typical SDR items such as RF, FPGA, DSP and GPP and the SCA core framework. The Gate-House BGAN waveform contains all the necessary software. The platform must support the characteristics of the BGAN system, such as: Operation in the L-Band, the receive band is 1518 MHz to 1559 MHz, the transmit band is 1626.5 MHz to 1660.5 MHz and 1668 MHz-1675 Mhz. The BGAN system is a full duplex system, that is, the platform must be able to receive and transmit at the same time. The BGAN system utilizes a number of channel bandwidths, from 10 kHz to 200 kHz.

Architecture
The main architecture of the radio is shown here:
The BGAN waveform contains two integrated components:
- The Protocol Stack
- The Physical Layer

The GateHouse BGAN waveform includes all the software necessary to use the BGAN services. The waveform includes code for FPGAs, DSPs and GPPs. The waveform is able to handle all UE (user equipment) classes; at start up the actual UE class will be configured. The waveform is developed to be easily portable across SDR platforms and will, as far as possible, only require standard SCA interfaces. The waveform has an interface for antenna pointing and control. The Physical Layer is a complete, high performance physical layer that is able to handle all UE classes. The physical layer manages the RF hardware, HPA and LNA. The platform can be any standard SCA compliant platform.

The hardware will typically include the following:
- DSP and GPP processors, on which the software will run
- One or more FPGA’s
- Connectors for user data and speech, e.g. Ethernet, ISDN, RS232 or USB
- Analog hardware, including LNA, HPA, ADC and DAC
- GPS receiver
- USIM card reader
- Antenna

The Core Framework used can be any SCA compliant Core Framework, including OS and Corba. The radio must have access to the GPS position and for mobile platforms also the velocity vector of the vessel.

Integration
Even if the purpose of using a SDR (Software Defined Radio) is to enable waveforms to run on any platform, some well-known porting effort of the waveform to the platform is required. The main part of the protocol stack is reused as it is; it will be ported to the SCA platform. Some additional features will be developed to interface to the platform. For the USIM card as an example, the protocol stack defines a relatively high level interface; some glue logic will be implemented to form the bridge between the USIM hardware interface and the existing protocol stack interface. When integrating the waveform to the platform a range of optional features and functions is available according to the customer’s requirements.

What are SDR, SCA and BGAN?

Software Defined Radio (SDR) is a technology that enables a number of waveforms to run on the same hardware platform. To change from one radio technology to another is as simple as loading the new software, the waveform, on the hardware platform. This means that one SDR can substitute a number of traditional radios, and thereby save space, weight and power. Ideally, the waveform will be able to run on any Software Communications Architecture (SCA) compliant hardware.

Software Communication Architecture (SCA) is an open, non-proprietary specification sponsored by the Joint Tactical Radio System (JTRS) program of the US DoD. It specifies software, hardware, security, and networking architecture requirements for open, programmable SDR systems with flexible, re-programmable communication capabilities. The goals of the SCA include open system architecture, cost effective utilization of COTS technology, waveform portability, software reuse and interoperability with other communications systems. The specification serves to assure that software written to the SCA guidance will run on SCA compliant hardware, and that SCA compliant hardware will run SCA compliant software.

Broadband Global Area Network (BGAN) is a 3G satellite communication system, defined and operated by Inmarsat. The system supports circuit switched and packet switched services with data rates up to 492 kbps bi-directionally. In 2013 Inmarsat launched their BGAN HDR Service offering channel streaming of an expected rate of up to 650 kbps. The system is served by four geo-stationary satellites. The Inmarsat-4 F1 satellite is serving the Asia-Pacific Region. The second satellite (F2) serves the Europe, Middle-East, Africa. The third satellite (F3) serves the Americas and the fourth satellite also serves Europe, Middle-East and Africa (This satellite is also named Alphasat). This gives the BGAN system a global coverage of 85% - total coverage (except polar regions).