SOFTWARE DEFINED RADIO

JTRS , SDR - 3000

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JTRS :

~ The JTRS radio is actually a family of software radios that share a common SCA and have hardware in common when possible, but some variance in the choice of hardware is permitted to meet the constraints of the five different domains.

~ Although it builds upon PMCS and the SPEAKeasy program, the SCA incorporates new concepts:

~ The SCA is being built around 2 key concepts:

* An open systems architecture
* The extensive use of object-oriented methodologies.

~ **Open System Architecture:**

An open systems architecture enables software portability across domains, simplifies the addition of new components, encourages the use of COTS components for both hardware and software, and promotes the creation of new technology by outside developers.

Implementing software components as objects adds to the modularity and reusability of the software.

Describing the general functionality of hardware components and using objects to control the hardware of a domain's implementation increases the interoperability of software across domains.

The use of objects is facilitated by a CORBA ORB. Encapsulation allows the SCA to support legacy code and use a wider variety of processing elements.

- The JTRS programming is ensuring that its SCA will be able to operate as a domain independent software radio architecture though its validation process and through interaction with software radio standard bodies.
- The SDR Forum brings together organisations from all over the world in an attempt to address software radio related issues.
- It provides a medium for its members to discuss ideas, the impact of proposed regulations, and new technologies on the financial technical aspects of software radio.

- However, its continuing primary focus is the creation of a software radio architecture that will support commercial implementations as well as military and government applications.
- Many of the SDR Forum's members are currently working on the JTRS program, and many members have experience implementing their own software radios.
- They are leveraging their experiences to create the SDR forum's software radio architecture
- The SDR forum is not in the business of building software radios; it is attempting to fill the role of software radio architectures, the SDR Forum hopes to foster the growth of software radio technology and to engender the creation of a "PC-like" wireless market.
- Because of the background of many members of the SDR forum, the development of the SDR forum architecture has closely paralleled the

development of the JTRS architecture.

~ The SDR Forum's architecture is explicitly based on JTRS's SCA. The SDR forum is tuning its architecture to meet the demands of all domains in which a software radio may be implemented particularly for commercial, civil and military applications.

The goals of the SDR Forum architecture are to:

* Implement an open system architecture,
* Be domain independent across all commercial, civil and military implementations,
* Support all existing waveforms, i.e., commercial, civil & military,
* Support the insertion of technology.

SDR-3000 Digital transceiver Subsystem

The SDR-3000, produced by Spectrum Signal Processing, Inc., is another example of a system that is fully compliant with the JTRS SCA.

The SCA core framework components are provided as a part of an **integrated radio solution.**

The SDR-3000 has a modular, scalable, software defined, digital transceiver subsystem capable of supporting dozens of **simultaneous transmit and receive channels**, each with an independent air-interface protocol.

Various air interface standards can be supported on the SDR-3000 platform, including all of the waveforms required for JTRS and the various 2G and 3G cellular standards, such as **WCDMA**

The SDR-3000 design has 2 particularly interesting aspects:

* The flexibility to tailor hardware modules that can be tailored to the needs of the radio application.
* The rapid and flexible transfer of data between modules.

The SDR 3000 consists of 3 flexible modules that can be tailored to the needs of the radio application:

* The PRO-3100 software-defined I/O processing module.
* The PRO-3500 baseband processing engine.
* The TMI-3300 transition module.

Transition module:- It interfaces directly to the RF subsystem and acts as the analog / digital interface for the system.

- This module supports up to 8 data converters at an aggregate rate of upto 800 Msps at 16 bits / sample for receive-only applications (or) 600 Msps in each direction for full-duplex operation.
- Each of the converters on the TMI-3300 operates coherently and support is provided to allow synchronization with other transition modules for multi antenna beam forming applications.
- The Software-defined I/O (SDIO) processor consists of 4 Xilinx Virtex II FPGAs and is available in various levels of complexity to suit the specific requirements of the user.

The rapid and flexible transfer of data between modules is a key challenge in designing a multimode software radio.

The SDR 3000 digital transceiver architecture is based on a passive backplane architecture.

This architecture makes use of three independent buses to meet the specific dataflow requirements for each section of the transceiver subsystem.

The I/O bus uses low voltage differential signalling to pass data at a maximum rate of 2.4 GB/s to and from the transition module. to the PRO-3100 modules and the baseband processing engines.

This bus uses a high speed serial protocol, such as serial RapidIO, to support a sustained rate of over 400MB/s per link.

Finally, the payload data bus uses a 100Mb/s Ethernet in an embedded CPCI packet switch backplane to allow communications between the digital transceiver and the rest of the software-defined radio. The 3-tiered communications methodology eliminates bottlenecks in