

Software Defined Radio, its Programmable Signal-Processing Unit, and Central Control Signal-Processing Unit

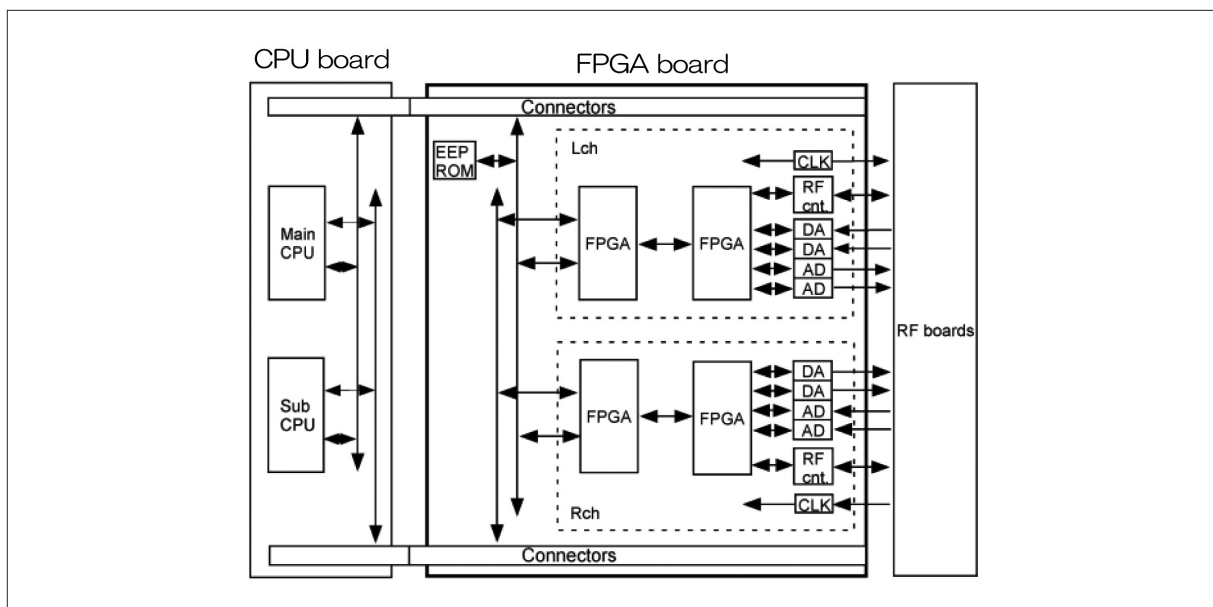
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External appearance of Software Defined Radio

Overview of the technique

The Software Defined Radio consists of a central control signal-processing unit (CPU board), a programmable signal-processing unit (FPGA board), and a wireless communication board (RF board). (See the figure below.) The CPU board consists of two or more CPUs, separate system buses corresponding to each CPU, and memory units connected to these system buses. The FPGA board consists of an FPGA providing a programmable electronic circuit structure and a rapid AD/DA converter. With the FPGA circuit and the CPU software provided for diverse communication systems, the Software Defined Radio can be used to implement any communication system that the user desires. Further, the device offers the significant feature of switching between different communication systems without interruption of communication. For example, when the user requests a switching operation or when the user begins to move out of the area covered by the communication system in current use, signal-processing switches from the main CPU to the sub CPU. This switching is performed after communication is established in the sub CPU, so user communication is never interrupted.



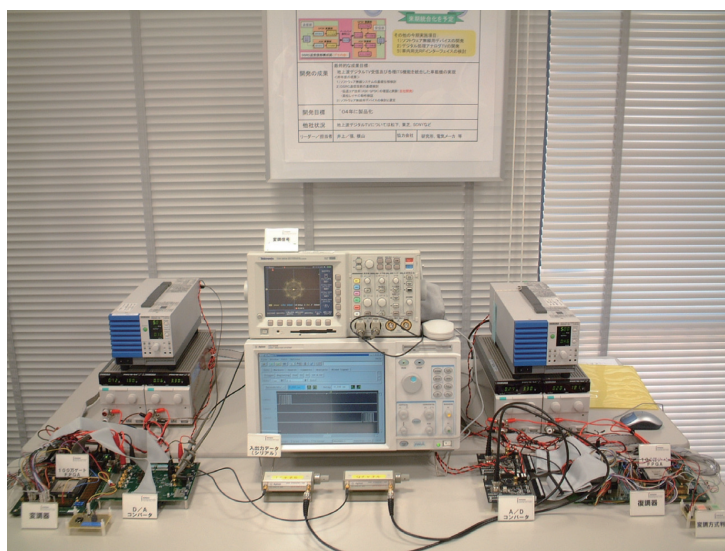
Outline chart

Development history of the Software Defined Radio

In December 1997, we began serious study of this Software Defined Radio, which allows implementation of any type of wireless communication system that the user desires in a single wireless device via changing of the software. In 1999, we successfully developed the first Software Defined Radio, allowing implementation of PHS, ETC, and GPS in a single wireless device through simple software changes. In 2001, we successfully developed the small second Software Defined Radio, which can implement ETC, GPS, FM/AM radio receiver functions, VICS, and FM teletext features in a single wireless devices many of these functions as the user desires. In 2004, we succeeded in developing the third Software Defined Radio, which can accommodate IEEE802.11a and the W-CDMA system (a third-generation portable phone system) in a single wireless device. The key technologies involved in this research and development include (1) reduced software installation time, which corresponds to less time required for reconfiguration, (2) a software download method, and (3) efficient digital signal-processing architecture. Building on achievements in research and development of these key technologies, the current technique has produced the present devices, cutting-edge both in function and in implementation, even as compared to global standards in the field of new-generation mobile communication systems for seamless communication between multiple wireless communication networks. This achievement has made NICT's Software Defined Radio known throughout the world. Further, the device now also supports Terrestrial Digital Broadcasting thanks to recent additional software development.

Technology transfer to private enterprises

This Software Defined Radio, which allows for the implementation of any wireless communication system that the user desires in a single wireless device through simple software changes, is highly valued as an elemental technology that will help establish the environments required for seamless services. The Software Defined Radio developed by NICT is commercially available through Midoriya Electric Co., Ltd.



Overall configuration of the modulation/demodulation experiment

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