Software Defined Radio (SDR)

The scope of wireless communications continues to expand from traditional static hardware platforms to more flexible software-based systems. This expansion is being driven by the demand for multiple function and application support by a single radio device in military, public sector, and carrier-class systems. To address this market, these industries have created Software Defined Radio (SDR), a common platform of components for defining and configuring wireless systems independent of hardware environments.

Software Communication Architecture (SCA)

Through a partnership between BAE Systems and Boeing, the U.S. military is leading the creation of a military SDR environment called the Software Communication Architecture (SCA). The SCA is sponsored and published by the Joint Program Executive Office (JPEO) of the Joint Tactical Radio System (JTRS). This architecture assists in the development of Software Defined Radio (SDR) communication systems, capturing the benefits of recent technology advances that are expected to greatly enhance interoperability of communication systems and reduce development and deployment costs.

The SCA has been structured to:

1. Provide portability of applications software between different SCA implementations
2. Leverage commercial standards to reduce development cost
3. Reduce software development time through the ability to reuse design modules
4. Build on evolving commercial frameworks and architectures

The SCA is specifically designed to meet both military and commercial application requirements. Since the SCA is intended to become a self-sustaining standard, a wide cross-section of the industry has been invited to participate in the development and validation of the SCA.

Core Framework

The foundation of the SCA is the Core Framework (CF). This defines the essential, “core” set of open software interfaces and profiles that provide for the deployment, management, interconnection, and intercommunication of software application components in an embedded, distributed-computing communication system. All interfaces defined in the SCA are part of the CF.

The goal of the SCA is to provide waveform and application portability and interoperability across SDR devices at a lower cost. However, achieving this goal introduces significant complexity, because SDR devices must support:

- Multiple standards like IPv6 and POSIX
- Heterogeneous hardware architectures: GPPs, DSPs, and FPGAs
- Constraints on size, weight, and power
- DO-178B safety and/or Common Criteria security certification

This complexity is magnified by evolving standards, fragmented tools and middleware, global market demand, and continuously rising customer expectations.

SDR developers using SCA as their underlying technology can benefit from:

- Use of digital signal processing through extensive employment of DSP and FPGA technology
- Minimizing RF processing as much as possible
- Abstracting the radio application (waveform) from the hardware platform underneath it through standards-based real-time operating systems (RTOSes) with SCA support, reusable hardware form factors, and waveform portability
- Supporting multiple waveforms per radio
- Ability to use a standards-based platform (hardware and software)
- Interoperability for facilitating redeployment of existing waveforms across services and coalition partners; provides the ability to “dial up” the waveform required on a single device
- Space/weight/power improvements by allowing multiple software waveforms to share a single computer
- Software patching (remotely, if desired); radio hardware can be upgraded independent of the application
Wind River SDR Solution

Wind River provides a commercial off-the-shelf (COTS) SDR solution for developers that supports industry standards and the ability to pick best-in-class tools for SDR devices. Supporting both real-time and Linux applications from a common development environment, our platforms have been proven in the global marketplace to speed time-to-market, reduce risk, and allow customers to build differentiated radio applications.

The Wind River development environment for Software Defined Radio includes:

- **POSIX SCA AEP 2.2.2-conformant library for rapid component integration**
- **Proven technology**
  - Thales Communications, a Wind River customer, was the first JTRS radio to receive JTRS SCA Certification; this radio was also approved by the NSA for Type 1 encryption through the Top Secret level
  - Wind River Workbench is standard for the U.S. Army’s FCS (Future Combat System)/SoSCOE program
  - More than 40 customers now use Wind River technology in SDR systems
- **DO-178B Level A certification documents available**
- **Multiple OS options available today:**
  - VxWorks 5
  - VxWorks 6
  - Linux
  - Linux + RTCore
- **Future OS support for SCA:**
  - VxWorks 653 (ARINC 653)
  - VxWorks MILS (Multiple Independent Levels of Security)

Wind River also has an extensive partner ecosystem to support SDR. All of the following partners have embraced the use of Wind River Workbench, which is based on Eclipse:

<table>
<thead>
<tr>
<th>Technology</th>
<th>Partner</th>
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<tbody>
<tr>
<td>SDR development tools</td>
<td>CRC (Communications Research Centre Canada), PrismTech, Zeligsoft</td>
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<tr>
<td>Core framework</td>
<td>CRC, Harris</td>
</tr>
<tr>
<td>Networking</td>
<td>Interpeak (acquired in 2006 by Wind River), OCI (open-source)</td>
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<tr>
<td>CORBA</td>
<td>ACE-Tau (open-source), OIS (Objective Interface Systems), PrismTech</td>
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<tr>
<td>COTS hardware</td>
<td>Aitech, Altera, AMCC, Curtiss-Wright, Freescale, GE Fanuc (Radstone, SBS Computers), IBM Microelectronics, Mercury Computer, RadiSys, Thales Computers, Texas Instruments, Xilinx</td>
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As the global leader in device software optimization (DSO), Wind River offers a rich set of market-leading operating systems, development tools, middleware, partners, and services that provides a complete foundation for meeting the stringent requirements of SDR systems.