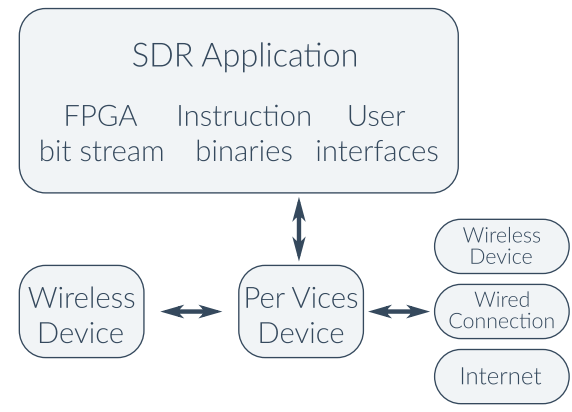


INTRODUCTION

With the implementation of 5G and other communication technologies just around the corner, interoperability testing becomes crucial for a successful implementation and roll out of networks. Testing and configuring platforms for low latency and increased bandwidth is crucial to helping address the increased global demand for enhanced mobile broadband services and relies on the collaborative and interoperable efforts of the technology industry. Open and interoperable standards allow for increased security, through collective efforts and greater transparency and oversight, and allow for advanced system architecture and software to be implemented and updated on a regular basis. Software defined radio is a dynamic tool and platform to allow the network to grow with demand and sophistication through its many features such as MIMO channels, broad frequency spectrum, and its software-embedded components.

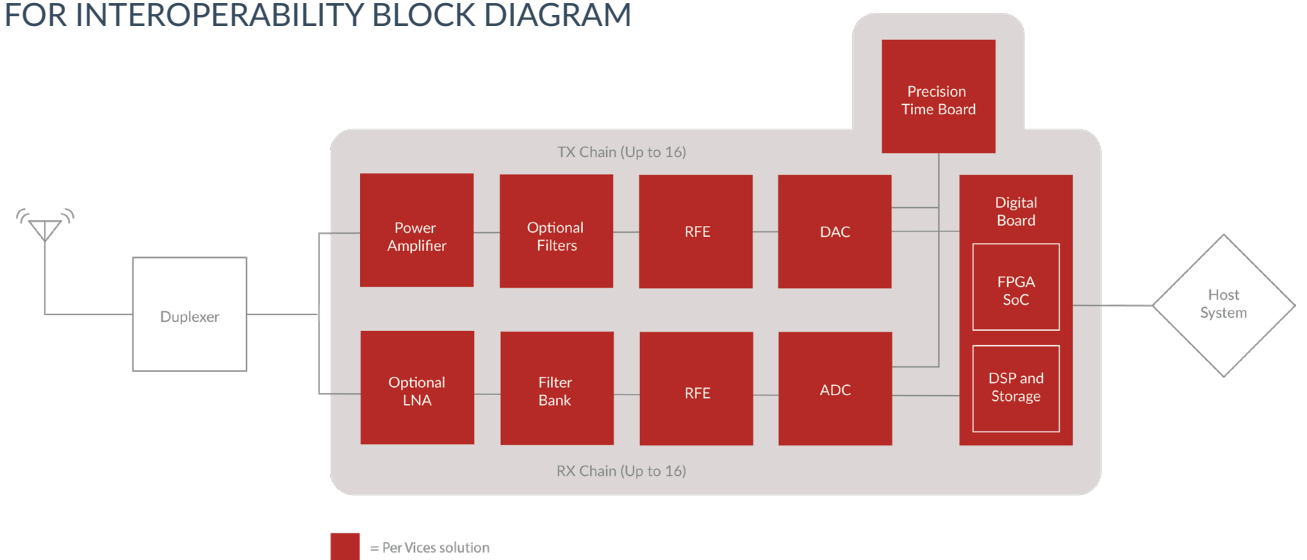
SDR FOR INTEROPERABILITY



TRADITIONAL VS. SDR BASED PLATFORMS

Traditional Radio Platforms	SDR Based Platforms
Single application and tuning frequency	Same hardware can be implemented into many systems; developing code is inexpensive and simpler than creating a new platform
Performance cannot be improved	SDRs can be tweaked and different algorithms can be implemented to support newer standards
Limited frequency range	SDRs can operate at multiple frequency bands simultaneously

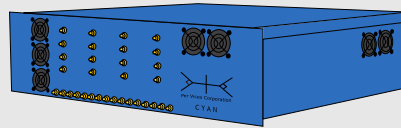
SDR FOR INTEROPERABILITY BLOCK DIAGRAM



SYSTEM ARCHITECTURE

The system architecture (see block diagram) shows a typical network for interoperability testing. A duplexer with transmit and receive chains with up to 16 channels allows for processing of signals at speeds at 80% of the speed of light. The digital board with an FPGA and DSP allows for execution of complex algorithms and running of customized programs to test all parameters and scenarios without having to reconfigure the hardware. A direct connection between the FPGA and any data source/end create a very reliable connection with very low latency and allows for high bandwidth. The filters are processed in software – allowing for a compact unit and fewer hardware-related breakdowns. With filters such as RTK, LNA, etc., the signals are processed with high phase coherence and accuracy, giving you confidence in your testing results and outcomes. A customizable and high quality Radio Front End allows for integration of various antennas and links while still locking signals, quickly digitizing them, and providing you with a long term asset and tool, that can be upgraded easily throughout its' long useful life.

TECHNOLOGY FEATURES



PER VICES STOCK PRODUCT

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HARDWARE

- Can operate at different frequency bands simultaneously
- Flexible radio front end for tuning to a wide frequency range
- High channel count and bandwidth to manage high data rates while rebroadcasting over different frequencies

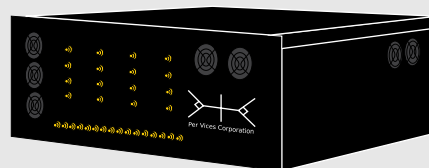
FIRMWARE

- Parallel operation to perform extremely intensive tasks quickly
- Forward error correction enabled in firmware
- Digital Up-Conversion and Down-Conversion done on platform

SOFTWARE

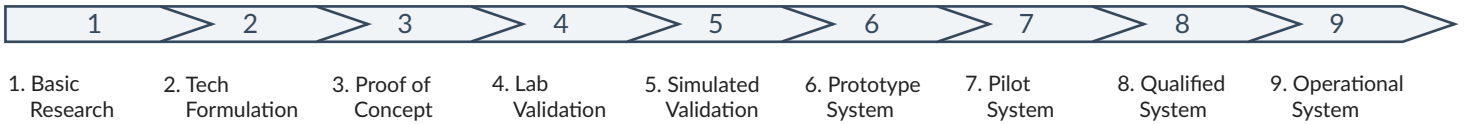
- Can be managed remotely with numerous options for debugging and troubleshooting
- Enables vulnerability and security assessments
- Open architecture for ease of use and upgrading

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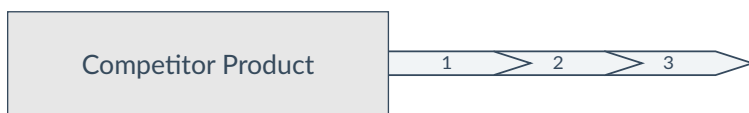


PLATFORM FOR CUSTOMER SPECIFIC APPLICATION

TECHNOLOGY READINESS LEVELS

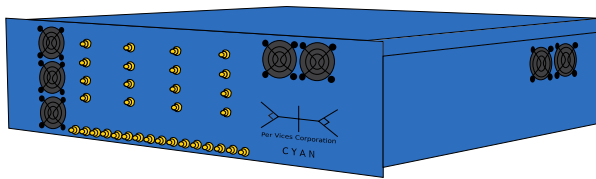


Technology Readiness Levels (TRLs) were established by NASA, and are used by government institutions and companies globally to enable uniform discussions of technical development and maturity across different technologies. Per Vices makes the only customer-validated SDR platform that supports manufacturers from ideation through full production.



The closest alternative to Per Vices products lacks flexibility, reliability and performance that customers require to develop wireless systems past the initial testing and Proof of Concept phase.

Customers Switch To Per Vices For:



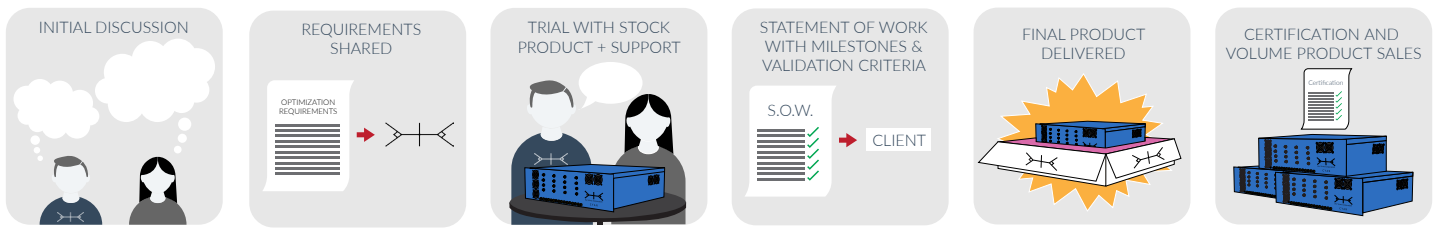
- Maximum flexibility - the ability to continuously update requirements and specifications as the design is refined.
- Easy integration - built-in connectors and tools that securely link hardware, data feeds, etc. into broader system design.
- Extensible performance - powerful, modular, software-driven features ramp up platform capabilities as needed. Per Vices products take you right from basic research all the way to the operational system phase on the TRL scale.



COMPETITIVE MATRIX

	Per Vices SDR	Component Providers	Application Specific SDR Providers	Test & Measurement Equipment Providers	Hobbysit SDR Providers
Integrated Platform	Yes	No	Yes	Yes	Maybe
Full Customizable	Yes	Yes	No	No	No
Production Performance	Yes	No	Yes	Yes	No
Software IP Support	Yes	Yes	No	No	Yes
Maintenance Support	Yes	No	Yes	No	No

PER VICES COLLABORATIVE PROCESS



MAJOR DIFFERENCES

Traditional hardware-defined radios, with specialized analog signal processors, are single purpose and difficult to modify. In contrast, Software Defined Radios (SDRs) have more flexible signal processing components that are designed to run on high-speed embedded systems. Each SDR application is an arrangement of the field-programmable gate arrays (FPGAs) on the radio working in place of the hardware components. Changing the SDR application changes the FPGA layout allowing the SDR to change its internal behaviour as if it had a whole different set of circuitry. This allows for trade-offs between reliability/latency and for algorithms to be updated frequently.

TECHNICAL SPECS

Software defined radio integration into IoT enables precision, flexibility, time accuracy, ease of integration, fast convergence times, high sensitivity, signal accuracy, various frequency ranges, low latency, interference rejection, FPGA resources, and the ability to update the system through software. It is an investment that brings consistent returns year after year by providing you with technology that can grow and develop with new advancements.

KEY POINTS

Per Vices focuses on delivering high-quality radios that are more commercially applicable. With a rise in 5G communications, mobile and broadband communications are at a tipping point with expectations of super fast speeds, high bandwidth, reliability, and availability. With crowded spectrums and growing demand for connectivity, having SDRs that are designed for congested or contested environments over a wide range of signal bands test for optimal network configurations is imperative for the successful launch and growth of communication networks. Our SDRs allow for interface rejection and RF interference protection, allowing for easy filtering and channel rejection and for running and analyzing dynamic simulations with many complex variables and thresholds.

WORKING TOGETHER

Please contact us at solutions@pervices.com to learn more about how we can help you. Following our initial discussion, our team will support you throughout the whole process, from a trial with a stock product, to developing out specific requirements for a statement of work, all the way to the volume integration and certification stage. Our engineers work with you each step of the way to ensure it's a smooth and easy integration of our product into your systems.