

# WHITE PAPER

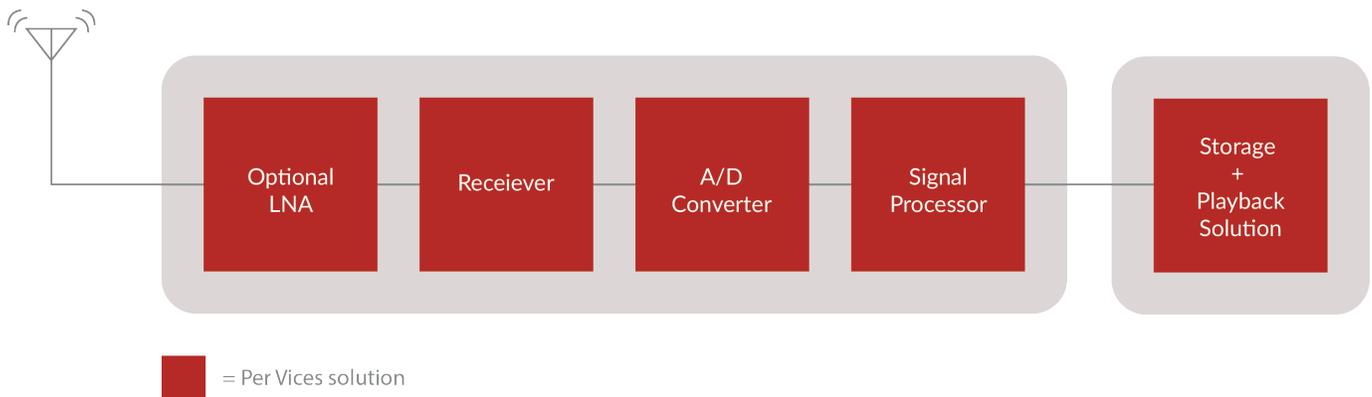
Per Vices Corporation

High Performance SDR for Spectrum Monitoring and Data Recording

## INTRODUCTION

With the huge increase in radio traffic and the implementation of 5G, spectrum monitoring is an integral part of enforcing compliance with radio traffic regulations, both as a matter of national security, and for ensuring uninterrupted transmissions across all parts of the spectrum. A system providing flexibility, dynamic functionality, and ability to adapt and keep up with the exponential growth in technology is needed. Per Vices combined radio and storage solution provides real-time spectrum monitoring and recording and enables easy integration for clients, as a COTS solution. A large RF spectrum coverage and user adjustable bandwidth, combined with technology for seamless data capture, make detecting events quick and accurate. Multiple channels allow you to capture a wide amount of data, and tune into specific parts of the spectrum for further analysis and higher data fidelity. Combined with multiple options for data storage, Per Vices Cyan and Storage and Playback Solution is the top-of-the-line solution on the market for mission-critical spectrum monitoring and recording applications.

## USE IN APPLICATION



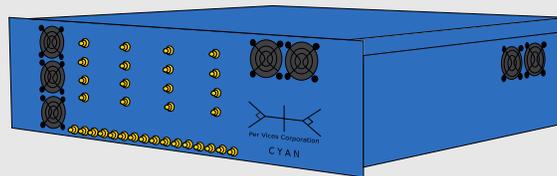
## SYSTEM ARCHITECTURE

The system architecture (see diagram) shows a typical network for spectrum monitoring and recording. Everything starts with the radio chain. With Cyan, this offers 1 to 16 independent radio chains, each offering adjustable bandwidths up to 1GHz, where the higher bandwidth would be useful for wideband monitoring and a narrow bandwidth would be used for better SNR for specific signal analysis. The data is sent to the FPGA which allows for real-time analysis and streaming. It is also possible to upconvert and/or downconvert the signal if desired. Following any other DSP performed using the FPGA, the data is sent over 4 x 40Gbps ports to a Recording and Playback Solution where the ability to process the data from a greater number of channels allows for better IODT, geolocation and mapping with the use of software. The more channels, the more accurate geolocation positioning is, therefore allowing you to deploy resources to a location with confidence and save valuable time by not having to extensively search and approximate a signals' location.

## TRADITIONAL V. SDR BASED PLATFORMS

Traditional Platforms	SDR Based Platforms
Single application tuning frequency	Same hardware can be implemented into many systems
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
Narrow bandwidth	SDRs offer very high bandwidths or can be adjusted in software for higher fidelity

## TECHNOLOGY FEATURES



### PER VICES STOCK PRODUCT

#### HARDWARE

- Can operate at different frequency bands simultaneously with many independent radio channels
- Flexible radio front end for tuning to a wide frequency range
- High bandwidth for capturing as much data as possible

#### FIRMWARE

- Real-time data capture and analysis
- Supports 4 x 40Gbps data transfer
- Digital Up-Conversion and Down-Conversion done on platform

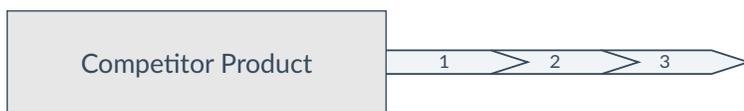
#### SOFTWARE

- Can be tuned and configured remotely
- Open architecture for ease of use and upgrading
- Lossless data transfer from SDR to host system for an easy-to-deploy solution

## TECHNOLOGY READINESS LEVELS

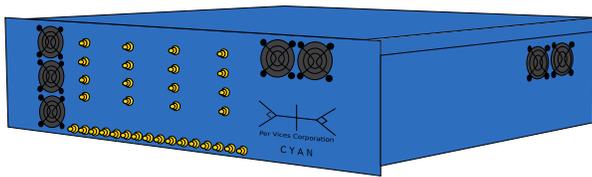


Technology Readiness Levels (TRLs) were established by NASA, and are used by government institutions and companies globally to enable uniform discussions of technical development and maturity across different technologies. Per Vices makes the only customer-validated SDR platform that supports manufacturers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

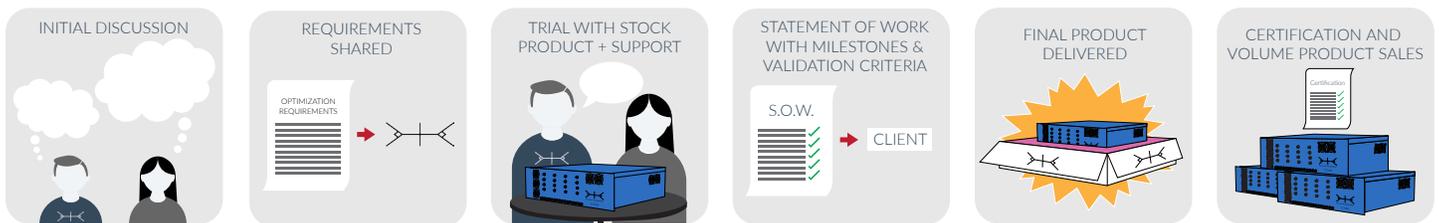
## MAJOR DIFFERENCES

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 it's 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 spectrum monitoring allows for wideband operation and can capture anything between DC and 18 GHz. With MIMO operations of up to 16 channels and fast tuning time between frequencies of 40us, you can scan a wide spectrum quickly and efficiently with no data gaps. Open architecture and top-of-the-line DSP & FPGA capabilities provide flexibility to grow and improve the system continuously. It is an investment that brings consistent returns year after year by providing you with technology that can grow and develop with new advancements.

## PER VICES COLLABORATIVE PROCESS



## KEY POINTS

Per Vices focuses on delivering high-quality radios for mission critical applications. With the crowding of the spectrum and need for uninterrupted and interference-free use, having SDRs that are designed for efficient monitoring with high accuracy and in real-time is imperative. Having a solution that can scale, go across multiple frequencies while providing consistent data rates and performance, saves money, time, and resources that can be allocated to other aspects of the project and for meeting your objectives faster. Together, we can design a reliable, long lasting system that is easy to configure and update to accommodate your organizations' evolving needs.

## WORKING TOGETHER

Please contact us at [solutions@pervices.com](mailto: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.