

Data center time distribution through White Rabbit

Precise timing is a critical requirement for replication mechanisms and security in data centers, so that all transactions, including security logs, can be accurately timestamped. This requires that all data centers share the same exact timescale, with all servers time-aligned.

[Seven Solutions White Rabbit clocks](#) can be easily integrated into a data center's architecture, combining White Rabbit interfaces for nanosecond time transfer with flexible configuration options (NTP, PTP, 1PPS, etc) for uncompromising time delivery performance.

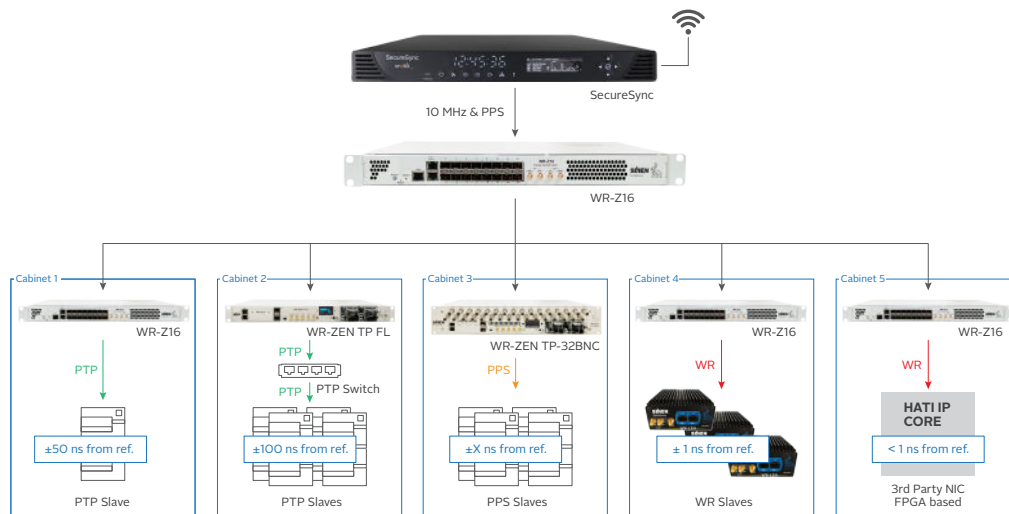
About White Rabbit technology

White Rabbit is the enabling technology that provides nanosecond accuracy for time transfer between and within data centers. The reduced time uncertainty budget between two White Rabbit nodes allows users to relax the time error requirement in the time distribution portion (within the racks), and allows scaling to massive numbers of transactions per seconds in applications where nanoseconds count, such as high-frequency trading.

Intra-data center time distribution

Seven Solutions and Orolia deliver best-in-class synchronization for data centers. The existing network infrastructures that have time synchronization protocols like NTP and PTP are vastly improved by using the White Rabbit protocol for time distribution. For intra-data center distribution, the solution is focused on distributing the resilient time reference provided by [Orolia's SecureSync](#). For minimum impact in the time error budget, Seven Solutions' White Rabbit devices transfer the reference time to any point, any cabinet, with sub-nanosecond accuracy.

The delivery of timing to the end user's equipment is provided with a wide range of available protocols (NTP, PTP, IRIG-B, ToD) as well as standard legacy timing signals like 10MHz and 1PPS. There is no need for link or cable calibration because White Rabbit is constantly measuring and accounting for the changes in the fiber optic link. White Rabbit is resistant to Packet Delay Variation (PDV) in environments with abrupt changes in traffic. It also allows users to work with redundant links and time references to provide a complete, resilient, PNT solution



Because it has tested and proven interoperability with third party equipment, White Rabbit can be safely integrated into your current infrastructure, enhancing its timing performance.

Capturing devices can use the PPS WR distribution. NICs and PTP-enabled switches can synchronize to WR devices using standard PTPv2.

Use case	Offset*
Sync Capturing Dev with PPS	<1ns
Sync NICs with PTP a)	~50 ns
Sync NICs two PTP b)	~100 ns

* PPS offset Peak-to-Peak

Inter-data center time distribution

Time distribution in a metro area

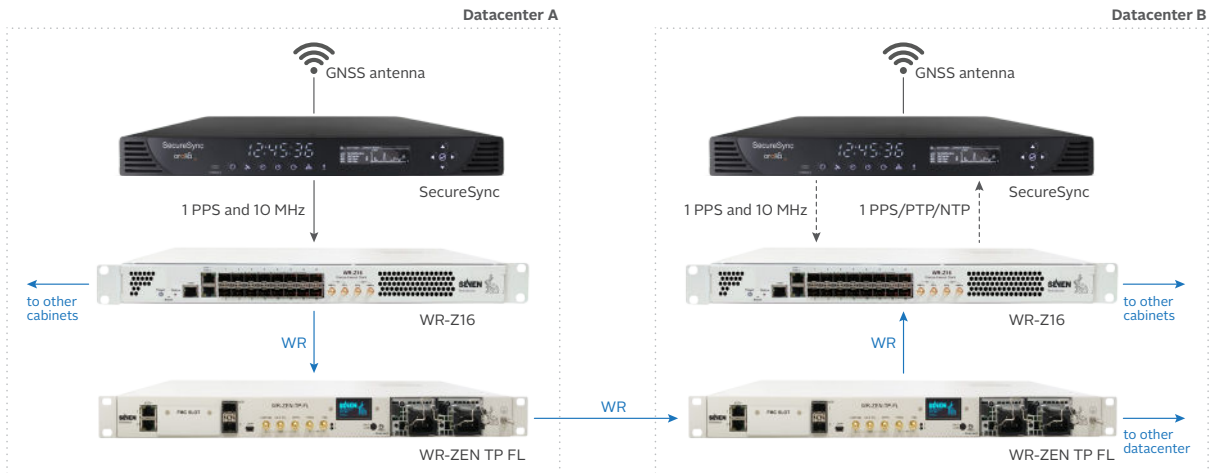
In a metro area, using the same time reference can be achieved by sending the clock reference over fiber from data center A to data center B. The only requirement is that the clock reference be in an area of around 100-150 Km wide, so they can be reached in a single hop. The end-to-end distance can be extended by using optical amplification or timing regeneration via intermediate WR nodes.



The solution includes an external time reference provided by [Oroliat's SecureSync](#) and the Seven Solutions' White Rabbit network, which distributes this time reference over several data centers. Interoperability with third-party equipment has been already tested with satisfactory results at the end nodes (NICs, packet capturing devices, etc.).

The resilience of the SecureSync combined with the failover mechanisms and holdover capabilities integrated in WR devices provides the ability to work in multi-source time references scenarios, resulting in a fully resilient PNT solution.

WR over dedicated fiber

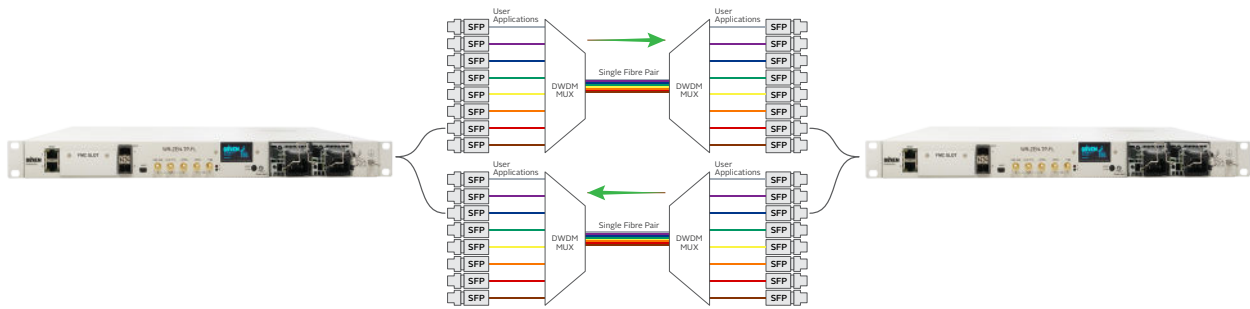


The use of dedicated fiber greatly simplifies installation and first operation. With its exceptional advantages over PTP, White Rabbit helps users benefit from automatic, dynamic compensation of the asymmetry. This makes installation much easier by avoiding the need to calibrate the links.

This scheme allows data centers to easily become sub-nanosecond synchronized. After that, users can distribute timing through the entire data center or extend it to a third.

WR over shared fiber

Using shared fiber in DWDM systems is a much more cost-effective solution. The only disadvantage is that the automatic asymmetry compensation is not possible because the elements on the optical path can change between different infrastructures. This causes an unknown offset at the timing slave that must be compensated for. This handicap is overcome by using calibration methods. There are different methods, depending on feasibility, and they can be GNSS-assisted or stand-alone. After proper calibration, the high precision and stability of White Rabbit ensures sub-nanosecond accuracy in this kind of scenario.



[Orolia](http://orolia.com) and [Seven Solutions](http://SevenSolutions.com) are both members of the [Open PNT Industry Alliance](http://OpenPNTAlliance.com), a coalition of manufacturers and service providers dedicated to helping their customers back up GPS/GNSS by delivering alternative forms of positioning, navigation, and timing (PNT).