

WRXI: status and plans

White Rabbit eXtensions for Instrumentation

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Outline

1 Short Overview of WRXI

2 Current Status & Plans

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2 Current Status & Plans



Introduction

- WR provides clock and time synchronisation.
- For some setups this is all that is needed.
 - Time and frequency transfer
 - Distributed precise timestamping
 - (...)
- For others, an additional communication and coordination layer is required.
 - Timing* systems
 - Distributed instrumentation
 - RF distribution over WR
 - (...)
- Need to exchange timestamped data payloads between **Nodes** in a deterministic way.



White Rabbit eXtensions for Instrumentation

- WRXI aims to standardise:
 - the contents of these **Event Messages**
 - the **API** for the configuration and monitoring of nodes and the relevant aspects of the WR network
- WRXI will also provide a **Supervisor** tool to:
 - enumerate new WRXI nodes
 - be a single entry point for the user
 - resolve scheduling issues
- The goal is to have WRXI-enabled equipment (also by commercial manufacturers) that is **plug & play** and **interoperable**.

Is WRXI better than LXI, PXI, [...]?

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Betteridge's law of headlines

“Any headline that ends in a question mark can be answered by the word no.”

Is WRXI better than LXI, PXI, [...]?

WRXI:

- is not a complete platform for remote control of electronic instrumentation.
- is a **subsystem** that handles **timing** and **triggering** over WR.
- can be used on top of another instrumentation platform, if that instrument supports WR.
- is **platform-agnostic** and can be used to exchange Event Messages between Nodes belonging to different platforms.



More Information

For a more in-depth introduction to WRXI and the motivation behind it, please refer to past presentations of WRXI:

- <https://www.ohwr.org/projects/wrxi/wiki/presentations>



1 Short Overview of WRXI

2 Current Status & Plans

Current Status

- **LXI Event Messages** (part of *extended functions*) the closest existing standard.
- **IVI 3.15 (IviLxiSync)** describes the API for handling LXI event messages.
- Active collaboration with IVI Foundation and LXI consortium.
 - Meeting held in Munich in June 2018 to discuss how WRXI could be made part of IVI/LXI
 - We will list our requirements, they offer to map them to IVI/LXI and extend where necessary
- An early demonstrator for CERN OASIS WR-based trigger distribution is under development.



Draft Proposal to IVI/LXI

- A draft proposal to IVI/LXI is being distributed for comments (currently at draft03).
- You can find the latest version at the WRXI project page in OHWR. Your comments are welcome!

White-Rabbit eXtensions for Instrumentation

Date: 06 October 2018
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Revision Table

Date	Version	Comments
20181006	draft03	Settle name to WRXI
20180730	draft02	Includes feedback received on draft01
20180625	draft01	Early draft released for feedback

1 Introduction

White-Rabbit eXtensions for Instrumentation (WRXI) is a synchronisation and real-time event communication protocol based on White Rabbit (WR) technology.

The aim of this document is to:

1. Define the packet format for real-time event messages, hereinafter referred to as Event Messages (EM).
2. Provide a transport mechanism for the exchange of EMs between WRXI nodes, hereinafter referred to as Nodes. EMs are exchanged directly between Nodes over the WR network.
3. Define an Application Program Interface (API) for scheduling and controlling the timing of EMs, as well as for monitoring and controlling the WR network aspects of Nodes and WR switches (e.g. get the round-trip delay, link status, estimated fiber cable length, set IP address, VLANs, etc).
4. Define an entity with a supervising role over the WRXI, hereinafter referred to as Supervisor.

<https://www.ohwr.org/projects/wrxi/documents>



OASIS WR-based Trigger Distribution

What is OASIS:

- Analogue signal monitoring system
- 6000 analogue signals
- 2500 multiplexed digitizer channels
- 300 trigger signals



OASIS WR-based Trigger Distribution

A “straightforward” application of WRXI:

- Convert OASIS triggers to Event Messages at the sources using FMC-TDC cards
- Broadcast them in the WR network
- Receive them with WRXI-enabled digitizers, or convert them back to TTL pulses using FMC-Delay cards



OASIS WR-based Trigger Distribution

- Based on LHC Instability Trigger distribution System (LIST).
- Internally based on MockTurtle, a deterministic, multi-core, soft-CPU.
- Rewritten API to abstract it and align it with IviLxiSync 3.15.
- Minimise the migration cost to WRXI once the latter is released.
- Use this example as a case study for current IVI/LXI shortcomings.



Outlook

- OASIS WR-based Trigger Distribution to be gradually deployed at CERN during 2019.
- Proposal to IVI/LXI group to be delivered in Q1 2019.
- Develop a WRXI-based “distributed oscilloscope” demonstrator for Q2 2019.

Feel free to join the discussions and participate in shaping the future of WRXI!



Thank you!

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