White Rabbit Robustness & Standardization Work in Progress

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CERN BE-CO
Hardware and Timing section

Technical Committee
12 March 2015

Outline

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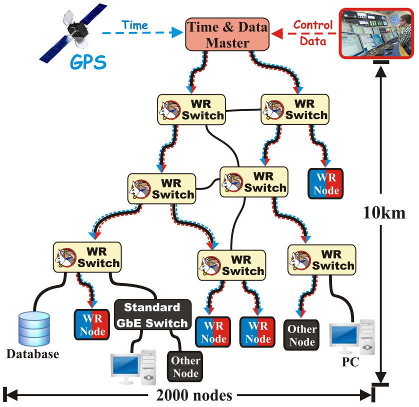
Robustness in White Rabbit Network (WRN)

Definition

WRN is robust/reliable if it provides all its services to all its clients at any time.



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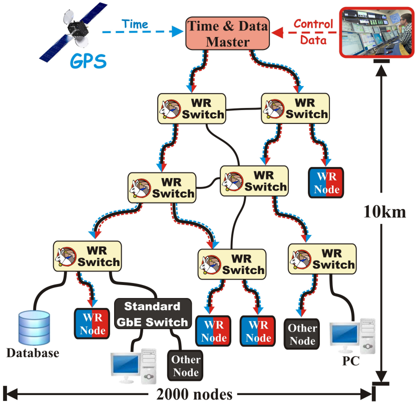

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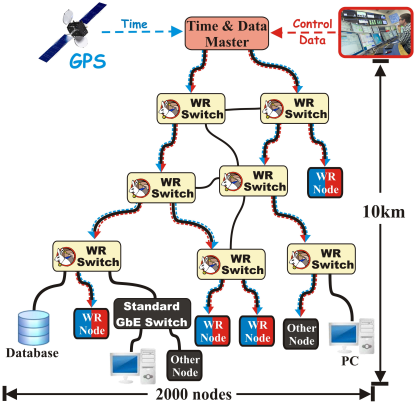

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- Robustness of WRN:
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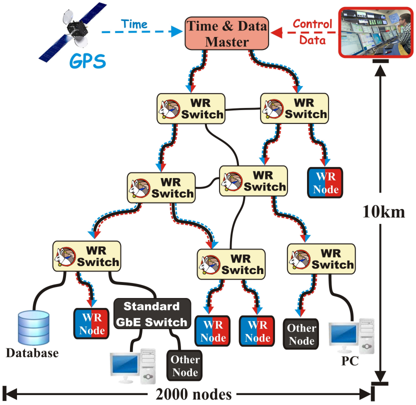

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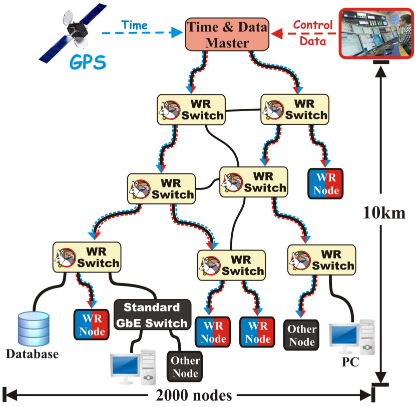
  - achieved through redundancy of elements & data and support for fast switchover (hot spare)



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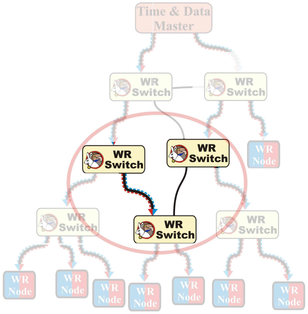
Support for seamless **time** distribution redundancy



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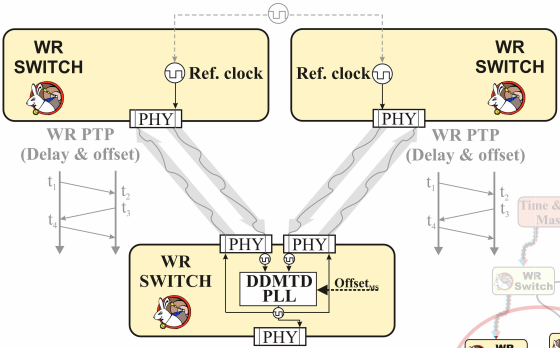
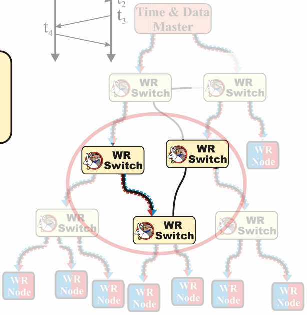




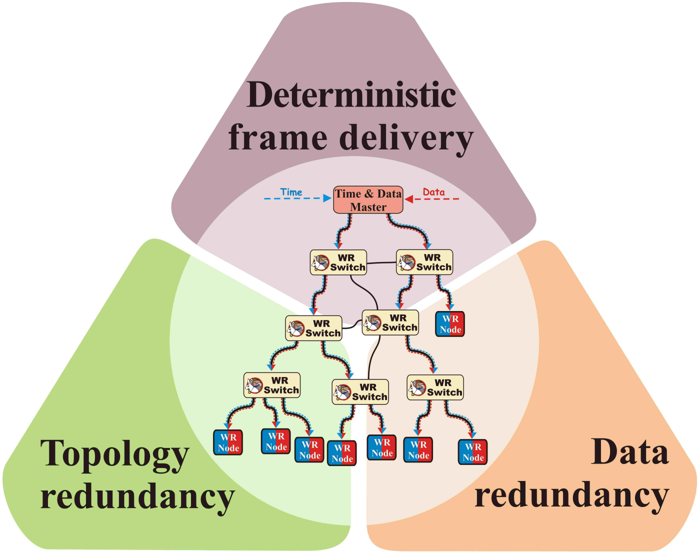
Seamless switchover requires:

Protocol: WRPTP

Hardware: DDMTD PLL

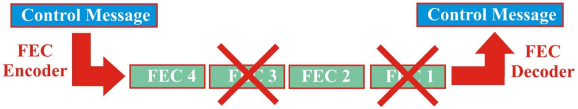
Outline

Robust **data** distribution in a White Rabbit Network



Data redundancy

- **Forward Error Correction (FEC)** – transparent layer:
  - One message encoded into N Ethernet frames
  - Recovery of message from any M (M<N) frames



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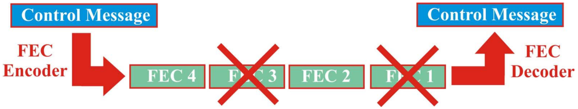

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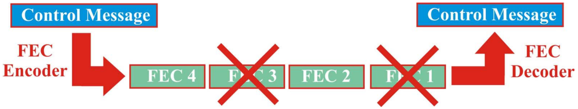

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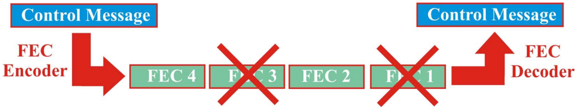
  - **network reconfiguration**



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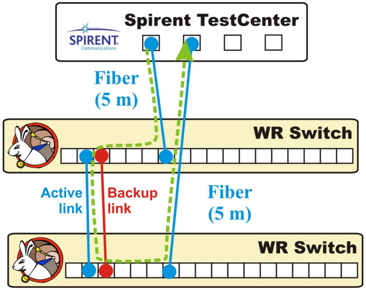

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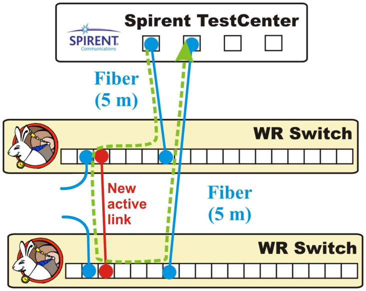

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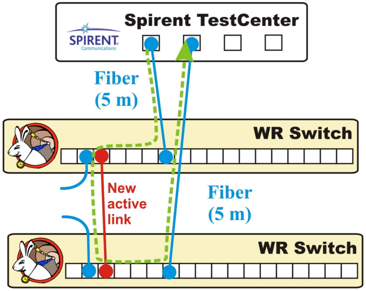

Frame Loss and Latencies

Frame Size (bytes)	Load (%)	Tx Frames	Rx Frames	Frame Loss	Max Latency (uSec)
288	10	1,217,533	1,217,533	0	5.84
288	30	3,652,598	3,652,597	1	5.84
288	50	6,087,663	6,087,663	0	5.84
288	70	8,522,728	8,522,727	1	5.84
288	90	10,957,793	10,957,792	1	6.12

Lost not more than 1 frame during switchover

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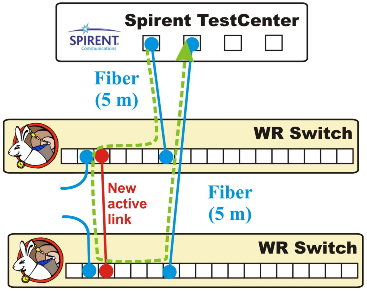

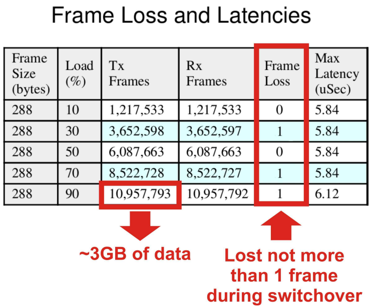
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Rapid Spanning Tree Protocol:

- reconfig time: 1s
- tx in 1s: 100MB = 360k frames

Shortest Path Bridging Protocol

- reconfig time: 50ms
- tx in 50ms: 5MB = 18k frames

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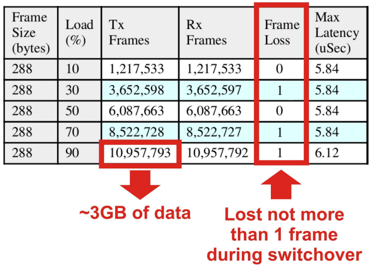

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Standardization can help in providing robust solution for CERN's current & future needs.

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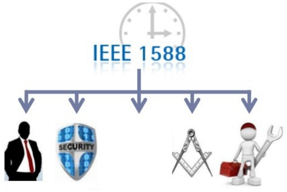

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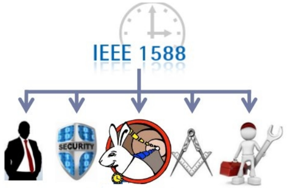

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- Divided into 5 sub-committees
- High Accuracy sub-committee
  - dedicated to White Rabbit
  - includes experts from companies & academia
  - chaired by Maciej Lipinski

IEEE 1588
SECURITY
CISCO
HUAWEI
BOEING
NIST National Institute of Standards and Technology
XILINX
SIEMENS
ROMA TRE UNIVERSITÀ DEGLI STUDI
T Deutsche Telekom
NATIONAL INSTRUMENTS

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  - Make the robustness features user-friendly
- Standardization
  - Make High Accuracy (a.k.a WR) improvements to IEEE1588 attractive for different industries/vendors
  - Integrate data-related WR solutions with proper standards

Thank you

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