



Queensland University of Technology Brisbane Australia

Assessment of Real-Time Networks and Timing for Process Bus Applications

Paper Reference 147_AU_Ingram

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Process Bus Test Bed





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Measuring Ethernet Switch Latency







Effect of Outbound GOOSE on Sampled Values





Merging Unit Performance



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Measuring PTP Performance



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Sync performance of PTP devices



PC

1-PPS

1-PPS

Effect of sampled Value traffic on PTP performance

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PTP Clock Performance





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Grandmaster Drift



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Without Redundancy

With Redundancy





Transparent Clock Assessment







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Slide 9

Interaction of Sampled Values & PTP





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Protection System Performance







Conclusions



- Quality of GM & slave directly affects sync performance
- Interactions are a non-issue
 - Transparent clocks required for PTP
 Outbound GOOSE & inbound SV do not interact
- Most latency created at first switch
- Protection performance
 - $_{\odot}$ Sampled values similar speed to conventional CTs $_{\odot}$ GOOSE \sim 3 ms faster than relay contacts
- Multivendor process bus works!



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