

Title of Diploma Thesis

Evaluation of Realtime Ethernet Systems in Testbed Environments
instancing EtherCAT

Student: DI (FH) Josef Perlinger

Mentor at the University: O.Univ.-Prof. Dr. Wolfgang Pree

Abstract:

Traditional proprietary fieldbuses dominate several types of complex automated industrial systems. They are wide-spread and can be found in nearly every industrial sector. Recently the new Ethernet Fieldbus EtherCAT sets new standards for real-time performance. EtherCAT is an open real-time Ethernet network developed by Beckhoff and the EtherCAT Technology group and is to be seen as a replacement for traditional fieldbus technology in the near future. The present diploma thesis deals with realtime functionalities and performance and handling issues of the realtime Ethernet fieldbus EtherCAT.

In the first practical part, the EtherCAT system is evaluated while running on the operating system Microsoft Windows. Important features for Field buses like error detection and error handling are investigated. Moreover the stability and robustness of hardware and software are analyzed. Additionally the Electromagnetic Compatibility was tested with an EMC burst measurement at power supply and data cables.

In the second part of the thesis the performance and handling operating on the realtime operating system INtime from Tenasys is discussed and verified. The measurement uses an Evaluation Board EL9800 from Beckhoff and an INtime EtherCAT master stack implementation delivered from Profimatics GmbH. The driver ensures access to the Evaluation Board inputs and outputs under the realtime operating system INtime. To proof the performance of the driver and the board, an INtime test application is being implemented. The maximum frequency with which the system can operate is detected and measured with the written test application in C++. In a certain time loop, the application sends several EtherCAT frames and measures the required time for sending and receiving one frame. Additionally CPU loads are measured and visualized in this scenario.

The objective of the diploma thesis is to test and evaluate the components developed by Beckhoff, to demonstrate the best areas of application, to render exact performance data and to make suggestions for using or refraining from EtherCAT in testbed environments.

Information

For detailed information see:

- <http://www.ethercat.org>

Date of Assignment: May 10th 2006

Estimated Completion Date: End of December 2006