AFDX: Real-Time Solutions For The A380

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CONTENTS

I ABSTRACT 1

II OVERVIEW OF AFDX 0

III HARDWARE ELEMENTS 0

IV SOFTWARE ELEMENTS 0

V REAL-TIME ISSUES 0

VI SUMMARY 0

APPENDIX 2

SELECTED BIBLIOGRAPHY 2

LIST OF ILLUSTRATIONS

I ILLUSTRATION 1 0

II ILLUSTRATION 2 0

III ILLUSTRATION 3 0

IV ILLUSTRATION 4 0

V ILLUSTRATION 5 0

LIST OF TABLES

I TABLE 1 0

II TABLE 2 0

III TABLE 3 0

IV TABLE 4 0

V TABLE 5 0

ABSTRACT

The objective of this paper is to describe and analyze how real time performance issues in the Airbus A380 flight-by-wire system development led to the inception of AFDX (Avionics Full Duplex Switched Ethernet). In the early 90's, when Airbus first started developing plans to build the super Jumbo Jet, the company launched an effort to identify and specify which new technology would be most beneficial in various domains. In the domain of databus communications, Airbus selected to move on from ARINC429 and eventually modify Full Duplex Switched Ethernet with the purpose of using it for avionics bus communications. This led to the specification of the AFDX protocol, which is based on the existing ARINC664 and IEEE 802.3 specifications. The goal was to take off the shelf technology and modify to meet real time performance issues and cost.

AFDX is a thousand times faster than it's predecessor (ARINC429) and is based on a well-established technology, Ethernet. The following is a provisional list of topics to be discussed in this paper. Within each topic, there may be subtopics to address specific issues.

1) Overview of AFDX
    a. ARINC Standards
    b. IEEE Standards
    c. AFDX Solution
2) Hardware Elements
3) Software Elements
4) Real Time Issues
    a. Communication
    b. Scheduling
    c. Simulation and Testing with LynxOS RTOS
5) Summary

Subtopics will be added to Hardware Elements and Software Elements. All subtopics will most likely also be expanded adding detail to the research.

APPENDICES

Any appendices should appear after the text of the term paper.

BIBLIOGRAPHY

[CES] Creative Electronic Systems S.A., *CES White Paper on ADFX*, 2003, http://www.ces.ch/documents/downloads/afdx_white_paper.pdf

This is CES white paper providing inception and background information on AFDX. Also provides a good overview of key concepts, features, and modules.

[SBS] Pickles, Bob, *Avionics Full Duplex Switched Ethernet (AFDX)*, SBS Technologies, 2006, http://www.sierrasales.com/pdfs/AFDX_Overview.pdf

This is SBS paper on AFDX. It include good overall information on ADFX as well as real-time issues, advantages, and disadvantages to ADFX solutions.

[CON] Condor Engineering, *ADFX Protocol Tutorial*, Condor Engineering, Inc., 2005, http://www.acalmicrosystems.co.uk/whitepapers/sbs8.pdf?PHPSESSID=04e3aa6b5b8e159b87ae0a3451dc457e

This is a protocol tutorial. It is an extensive and detail guide to ADFX. It provides detailed information on communication and scheduling.

[ACT] Actel, *Developing AFDX Solutions*, Actel Corporation, 2005, http://www.actel.com/documents/AFDX_Solutions_AN.pdf

This is Actel's paper on solutions for AFDX. It provides a good overview of AFDX and specific hardware implementation.

[MTE] MTEMag, *LynxOS For The A380 Superjumbo*, Micro Technology Europe Magazine, February 2006 issue, Pg. 14-17, http://www.mtemag.com

This is an article providing information on simulation and testing of AFDX. It describes CES AFDX hardware modules and the use of LynxOS RTOS.