ISAE SUPAERO
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INP TOULOUSE ENSEEIHT

P4FDX

IMPLEMENTATION OF A REAL-TIME ETHERNET WITH QUALITY-OF-SERVICE MECHANISMS

AFDX NETWORK USING P4 LANGUAGE

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Our missions

AFDX P4 HARDWARE IMPLEMENTATION

Implement AFDX network switching capabilities on real hardware: PC (Linux stations) along with raspberry PI3 and PI4.

QUALITY OF SERVICE MECHANISMS

Add quality of service mechanisms such as SPQ, WRR and optionally DRR to the P4 based AFDX switches.

Our solution

AFDX on pc

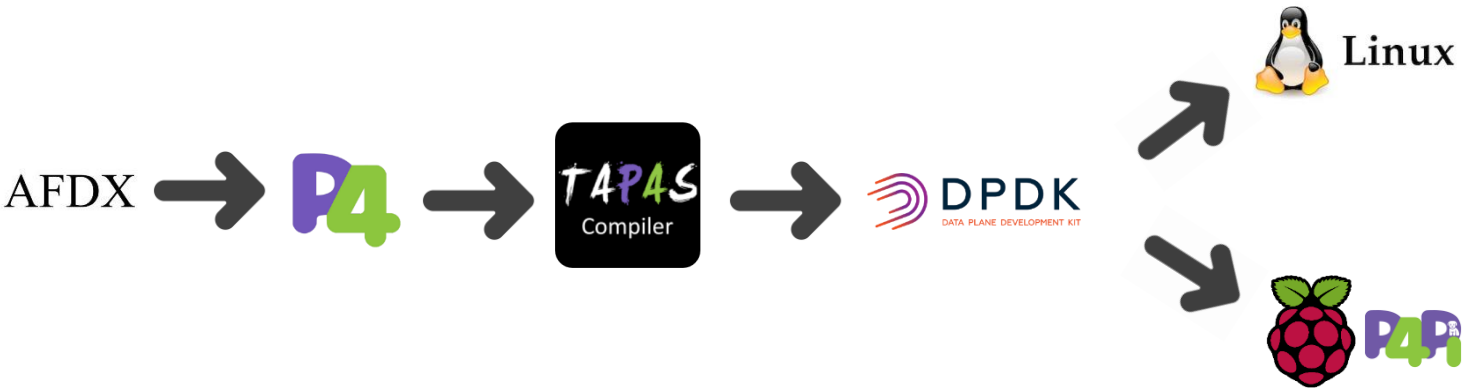
Using the library DPDK and the compiler T4P4S, a solution was implemented to give a Linux PC the capability to act as an AFDX switch using the language P4.

Afdx on Raspberry PI 3 & PI 4

Using the network data plane P4PI, both versions of Raspberry pi3 and pi4 can be turned into functional AFDX switches.

QoS for AFDX

A Static Priority Queue along with pseudo Weighted Round Robin algorithms were implemented on P4 using the software p4 compilation target ***behavioral model v2*** (BMV2).



Growth highlights

Airbus, the market leader in AFDX deployment as of 2022, does not adopt a quality-of-service mechanism. This study served as a proof of concept for the viability of incorporating such processes into the AFDX airborne network, potentially adding an additional layer of security by prioritizing time-sensitive flows (such as flight control) above less crucial ones (infotainment for example).