TEC-EDD

CANopy: A VHDL implementation of CANopen Protocol for CAN Bus On Board Spacecraft

IP Cores Workshop

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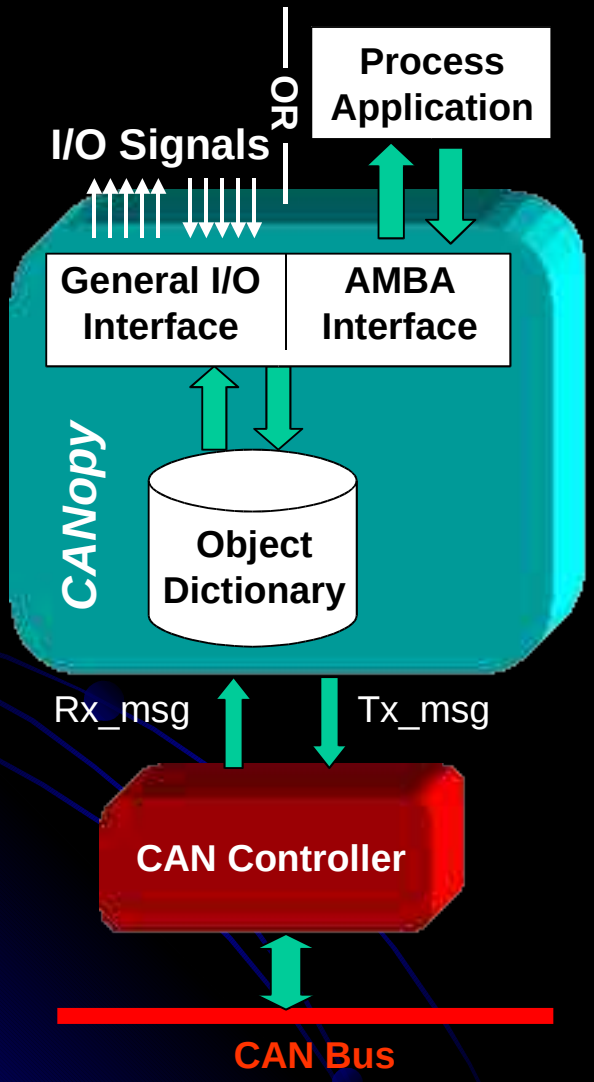
CAN in Space

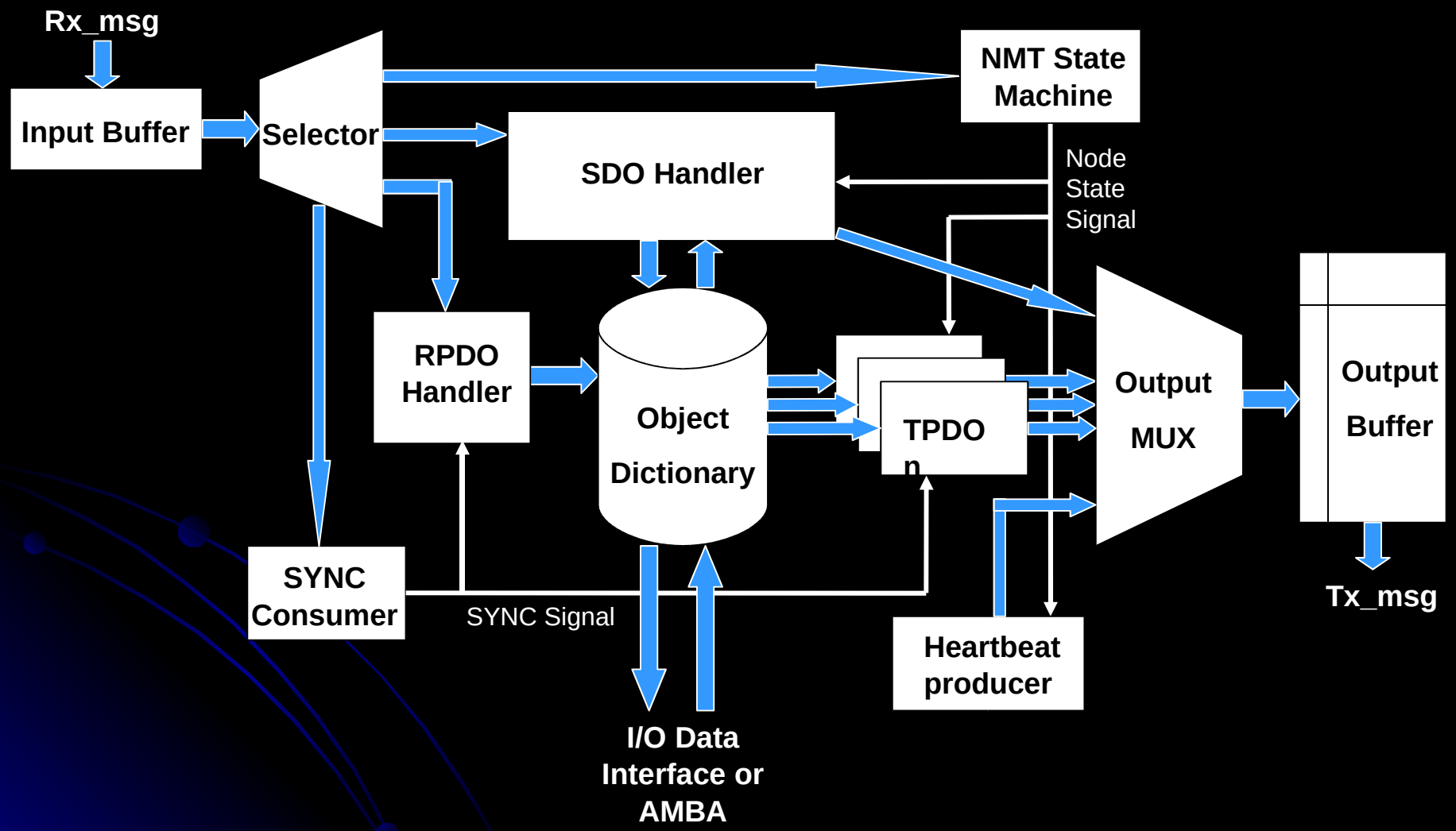
- CAN Working Group Draft Recommendation
  - Higher Layer Protocol (CANopen based)
  - Physical Layer, Redundancy Architecture & Algorithm
- CAN Building blocks available
  - Transceivers, CAN Controllers … What for the HLP?
- Why a VHDL implementation of CANopen?
- CANopen traditionally implemented in software
  - Good approach for terrestrial application
  - Mass production/Low-cost microcontrollers widely available/Simplifies system evolution
- For space, hardware-only implementation advantages
  - Availability of microcontrollers/processors is limited
  - Possibility of having CPU-less implementations
  - For use in simple remote terminals
  - Suitable for System-on-Chip solutions
  - Reduced complexity of the software in CPU-based nodes

CANopy interfaces



- General I/O Interface
- AMBA Interface
- CAN Controller Interface

CANopy architecture



Preliminary synthesis results

- Version 1.3 synthesised using Synplify Pro for Actel FPGA RT54SX72S-1
  - Object Dictionary of 32 objects
  - SDO Server
  - NMT State machine
  - 2 TPDOs, no RPDOs implemented
  - 5 messages Priority ordered output buffer
  - HurriCANe CAN Controller integrated

  - CANopy: 36%
  - HurriCANe: 23%
  - CANopy+HurriCANe: 59%

- Version 1.4 including RPDOs and 60 objects in the object dictionary is currently under simulation tests