SpaceWire in Data Systems Equipment

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Company Overview

Saab Ericsson Space Group

- Saab Ericsson Space — Gothenburg & Linköping, Sweden
- Austrian Aerospace — Vienna, Austria
- Sales Office — Los Angeles, United States

Saab Ericsson Space Products

- Mechanical Systems
  - Sounding Rocket Guidance Systems
  - Launcher/Satellite Separation Systems
  - Launcher/Spacecraft Adapters
  - Spacecraft Assembly, Integration & Test
- Antennas
- Microwave Electronics
- Digital Electronics
  - On Board Computers (Ariane 5, Vega)
  - Instrument Control Units
  - Data Handling Systems
  - Spacecraft Management Units

SpaceWire Related Projects

Launched

- Rosetta, Mars Express, Venus Express — IEEE-1355, SMCS, RS-422

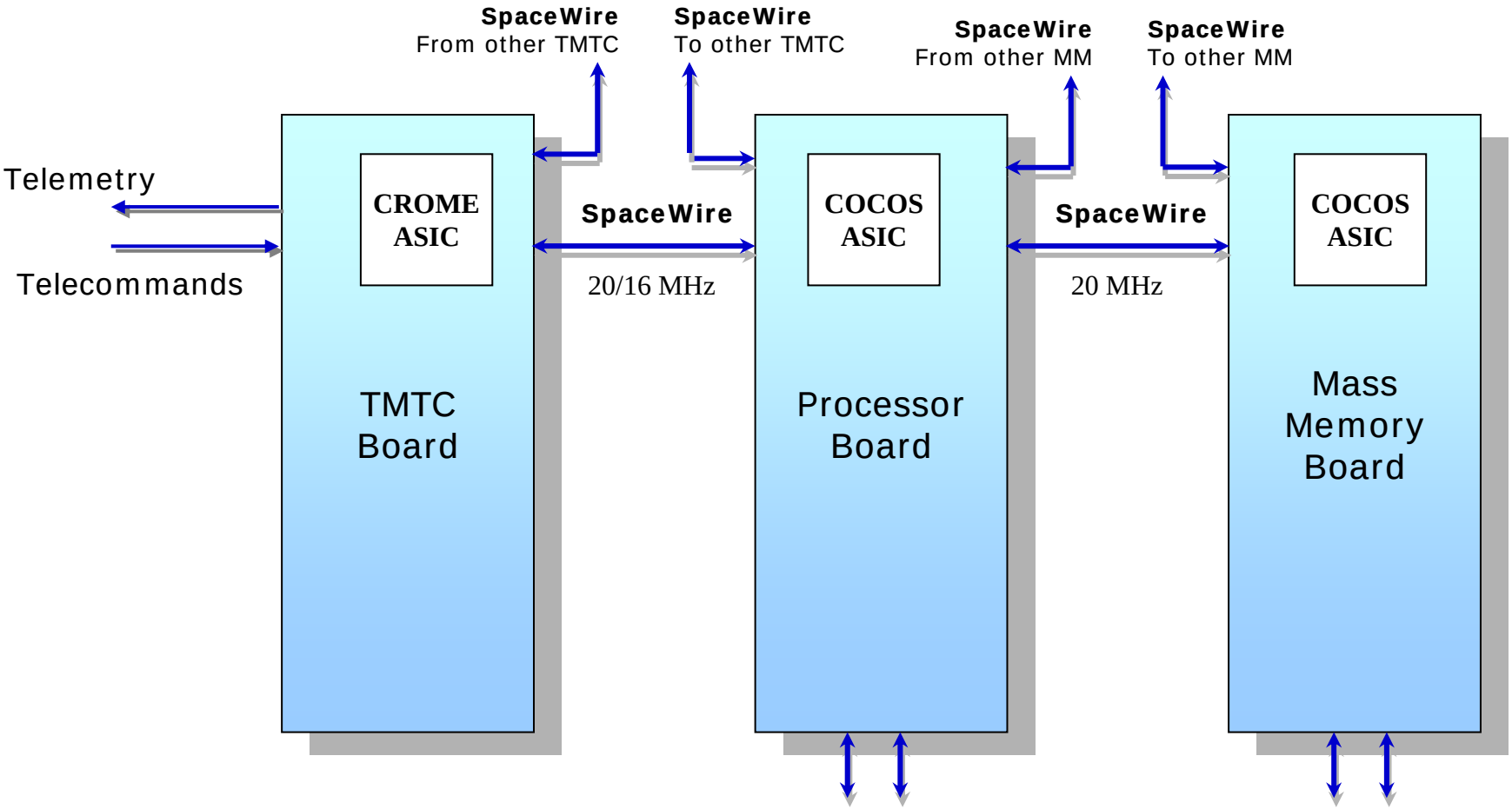
Current Generation of Data Systems Equipment

- Herschel/Planck CDMU & ACC
- Pleiades OBMU
- Aeolus CDMU
- Galileo ICU
- ...

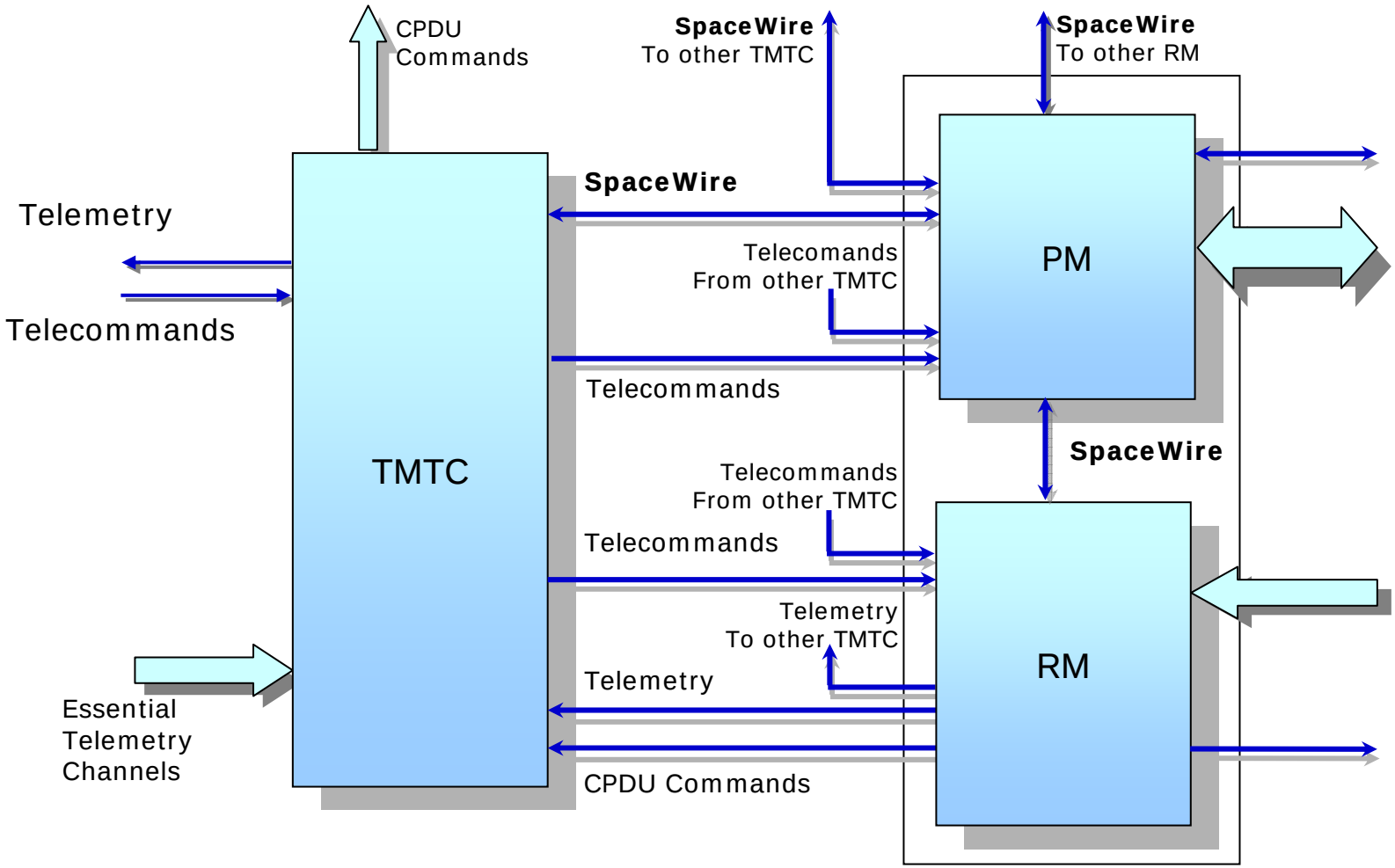
Development in Progress

- Highly Integrated Data and Control System (HICDS) — BepiColombo
- Remote Terminal Controller (RTC) ASIC
- COLE ASIC and Panther Processor Board
- ...

Current Generation Core Architecture



HICDS Core Architecture



SpaceWire Implementation

- SpaceWire IP Block (CROME, COCOS, ...)
  - Based on Austrian Aerospace SSEPPL codec (100 MHz)
  - Transmit & Receive Virtual Channels (up to 8)
  - Support for CCSDS packets
  - SpaceWire Header Registers

Virtual Channel Concept

- Independent DMA Channels
- Each Virtual Receive Channel is addressed with a path address byte
- Each Virtual Transmit Channel can send a path address (8 bytes in registers)
- Round-robin arbitration

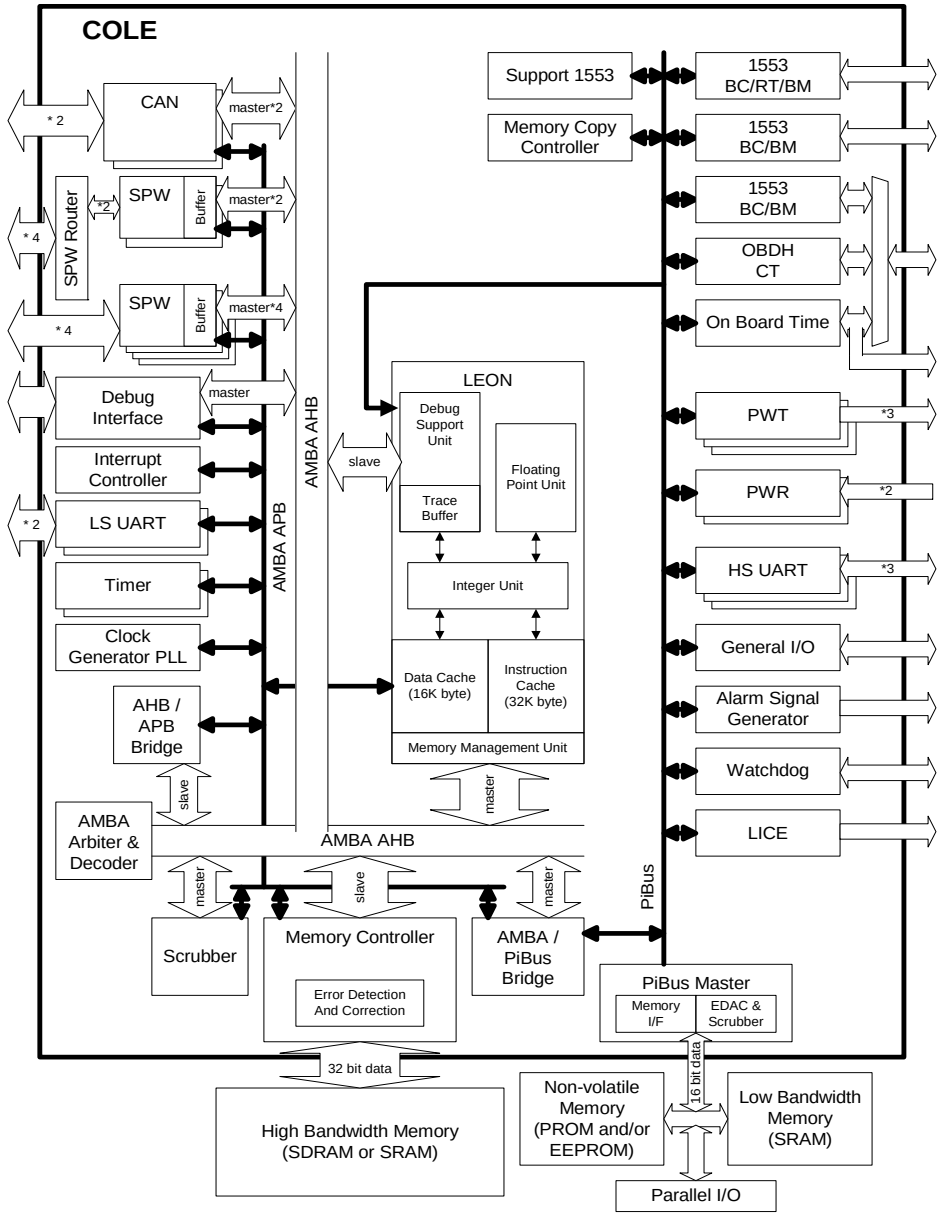
COLE ASIC

Integration of:

- LEON-2 FT processor
- COCOS ASIC
- SpaceWire Router

SpaceWire IP Block:

- Supports RMAP
- ESA codec (200 MHz)
- Transmit Sendlists
- Virtual Channels



Main use of COLE in a Spacecraft Management Unit

- Processor Module (PM)
  - All processing and I/O functions
    - Internal SpaceWire connection to TMTC (telemetry, SGM, control)
    - Internal SpaceWire connection to MM (control, data)
    - Internal PacketWire receiver from TMTC (telecommands)
    - Internal connection to I/O boards: MIL-STD-1553B, OBDH, SpaceWire
    - External I/O: SpaceWire, MIL-STD-1553, CAN, UART, ...
  - Memory interface with SRAM scrubbing
- Mass Memory (MM)
  - Control and I/O functions
    - Internal SpaceWire connection from PM (control, data, program load)
    - Internal connection with TMTC (telemetry)
    - External I/O: SpaceWire, ...
  - Memory interface with SDRAM scrubbing and refresh

Panther FPGA Processor Board