ESA Supported General Purpose Standard Microprocessors

MPSA
Roundtable on
Microprocessors for Space Applications
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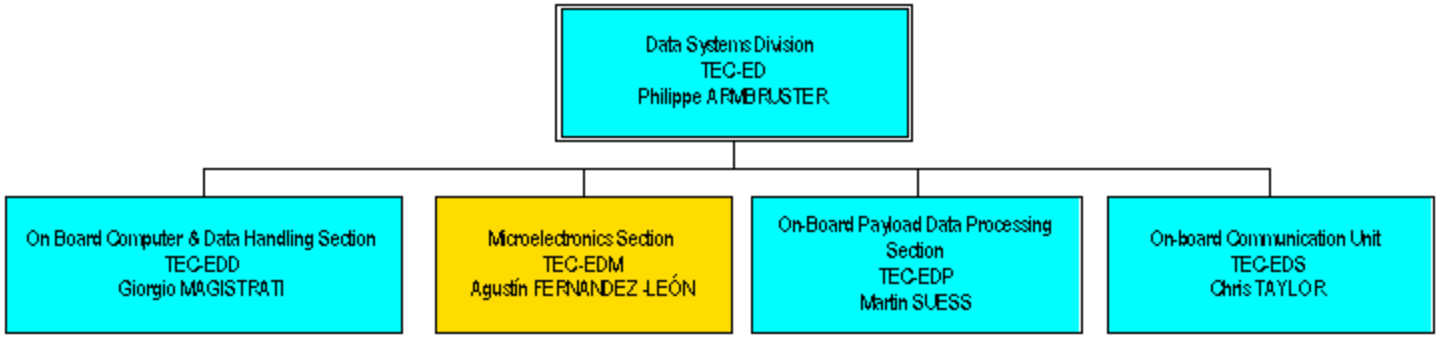


- **General Purpose Microprocessor contracts used to be in TEC-EDD**
  - *Chip developments supported by TEC-EDM (Microelectronics Section)*
  - *André Pouponnot retired in November 2008*
  - *Chip development activities were transferred to TEC-EDM*
- **DSP developments in TEC-EDP**
- **On-Board Computer developments in TEC-EDD**
- **Acknowledgements to André Pouponnot**

General Purpose Standard Microprocessor

- **Definition of "Application Specific Standard product"**
  - *http://en.wikipedia.org/wiki/Application_specific_standard_product*
    - » An ASSP [...] implements a specific function that appeals to a wide market. [...] ASSPs are available as off-the-shelf components.
- **General Purpose Microprocessor**
  - ***Common architecture (Intel, Sparc...)***
  - ***Widespread know-how and development tools***
  - ***Compatibility with SPARC V8 architecture was requested at the Microprocessor round-table in September 2006***
    - » http://conferences.esa.int/01C25/Microprocessors/NG-MP-RT-06-Proceedings/
    - » → restricted access, password on request from the author
- **Other Microprocessors**
  - *Proprietary System-On-Chip devices → session 2*
  - *Microcontrollers for mechanics control → session 3 this afternoon*
  - *Digital Signal Processors → session 3 this afternoon*

ESA Supported Standard Product

- **What means an "ESSP"?**
  - *Development funded by ESA to a significant extent*
  - *Parts available as off-the-shelf product under fair and equal conditions to users in ESA member and participating states*
  - ***Full documentation available to users***
    - » Comprehensive data sheet, user manual, application notes
    - » Functional/radiation validation and qualification reports, errata sheet
  - ***Technical support available to users***
    - » ESA is not the the support hotline, but ESA tries to ensure support by requesting contractual commitments from design house and/or foundry
    - » Support is not for free → included in parts price, or at extra charge
    - » ESA may exceptionally complement support – resources permitting
  - ***Availability of SW development tools***
  - ***Component availability outside ESA states not excluded***
    - ➔Subject to export regulations

Standard Product Business Models

- **Procurement and support through foundry**
  - *e.g. TSC695 (ERC32), AT697, AT7913 (SPW-RTC, ?)*
  - *Pro: Service out of one hand*
  - *Con: Foundry may not have first hand design knowledge*
    - » know-how transfer required, or support subcontracted to design house
- **Procurement through foundry, support by design house**
  - *e.g. the Spacewire products (SMCS, Router)*
  - *Pro: Foundry expertise for qualified parts*
  - *Pro: design house has best design knowledge*
  - *Con: Possibly difficult financial and IPR negotiations*
  - *Con: User has two interfaces*
- **Procurement and support through design house (e.g. SCOC3)**
  - *Pro: Service out of one hand, design house has design knowledge*
  - *Con: Design house needs facilities to handle qualified parts*
  - *Con: Design house has no full control on parts availability*

ESA GP Microprocessor Portfolio

- **MA31750 (MIL-STD-1750A)**
  - *obsolete, but still in use (Mars/Venus X-press, Rosetta)*
  - *http://www.dynexsemi.com/assets/SOS/Datasheets/DNX_MA31750M_N_Feb06_2.pdf*
- **Atmel Sparc processors**
  - *http://www.atmel.com/dyn/products/devices.asp?family_id=641*
  - ***TSC695: "ERC32 single chip", AT697: based on LEON2-FT IP core***
- **Next Generation Micro-Processor (NGMP)**
  - *Based on requirements from Round-Table in 2006*
  - *Under development by Aeroflex Gaisler*
  - *Uses LEON4-FT IP core*
- **System-On-Chip devices**
  - *High effort and cost to establish as ESSP → limited portfolio*
  - *SCOC3: comprehensive SOC with LEON3 and TM/TC*
  - *SPW-RTC: 'light' LEON2 CPU, focus on SPW and CAN interfaces*

Standard Microcontrollers

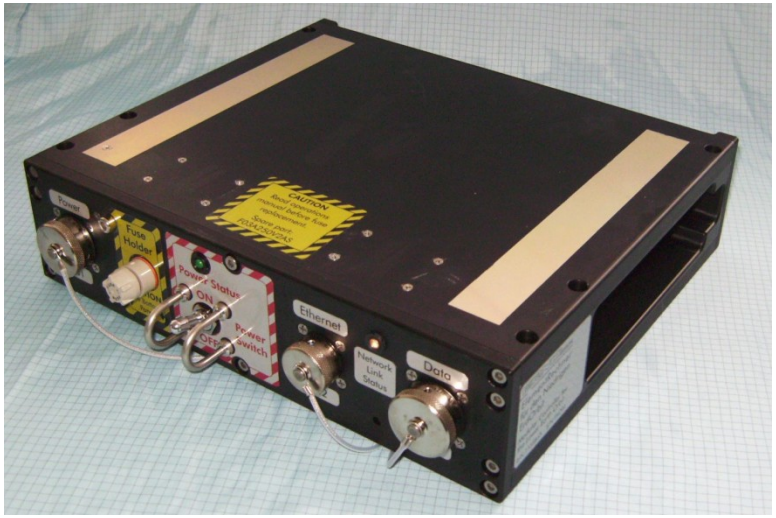
- **Microcontroller Definition**
  - ***http://en.wikipedia.org/wiki/Microcontroller***

  A microcontroller is a small computer on a single integrated circuit consisting of a relatively simple CPU [...]. Program memory [...] is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for small or dedicated applications.
  Thus,[...] simplicity is emphasized.

  → limited performance, low power, small memories, deterministic
- **8032 based microcontrollers**
  - *Atmel 80C32 → Obsolete → see Atmel presentation*
  - *80S32 developed <= 2001 by ADV/Transwitch in 0.5 µm (ESA contract)*
  - *Failed establishment as ESSP – technology MG2RT obsolete*
- **→ New Microcontroller based on LEON**
  - *downsize LEON IP core to minimum functionality: cacheless, 8-bit memory interface, on-chip RAM*
  - *ITT in 2009 – no contract attributed yet*

AT697 Flight Heritage

- **ERNO-Box**
  - *Columbus "Entwicklungsring Nord"*
  - *AT697E based computer*
  - *Developed by Astrium Bremen*
  - *Launched 2008 (?)*
  - *Memory failure*
  - *Return to ground in July 2009*
  - *Refurbishment ongoing*
  - *Re-launch in 2010 for further experiments*



- **PROBA-2**
  - *On-board computer*
  - *Developed by Verhaert*
  - *50 MHz, SDRAM*
  - *Launched on 02-Nov-2009*