25 (and counting) years of SPARC history in SPACE

by Mr. Jiri Gaisler (Former ESA & Cobham Gaisler)

How, three decades ago, did the ESA come to choose SPARC over a custom ISA (or perhaps negotiating a limited perpetual license for another RISC ISA)?

At the time ESA performed two architectural studies, evaluating processors such as MIPS, THOR, MC68020, I386, NS32. ESA also invited industry for round-table discussions. Finally, SPARC was selected due to:

- Open architecture without patents or license fees
- Well designed and documented
- Easy to implement
- Established software standard
- Available design

The final report for the ERC32 program states that:

“Furthermore, it was requested to "reuse" an existing processor architecture in order to minimize both software and hardware development cost. Performed ESA and industrial studies resulted, at that time, in the selection of SPARC instruction set architecture as the baseline. This was in order to e.g. simplify bread-boarding and software development.”

So, ESA decided to specifically require an existing ISA to be used, which implied creating:

- the entire chip design (instead of being able to use existing building blocks as with SPARC)
- compiler,
- all software including the OS,
- cross-compilation and other equipment you need to develop software for this new ISA.

An immediate direct consequence was the convenience of having off-the-shelf hardware for the thousands of systems needed on earth, for development, testing etc. Another consequence was the possibility of build upon thousands of man-years already invested in testing the SPARC architecture and software. By 1991, any bugs in SPARC were well-known; SPARC software was mature and in use everywhere. A custom ISA might have gained a bit more efficiency, but at cost of increase the difficulty of the project by several orders of magnitude.

Designing SPARC processors can be done without any licenses whatsoever. This is indeed why Jiri Gaisler has selected SPARC for the development of LEON (just see how many times Intel, MIPS and ARM have sued companies that developed processors using their architecture).

For example, in mid-February 2002 the legal battles between Lexra/MIPS and picoTurbo/ARM have both ended with a complete defeat of the two cpu-cloning companies (Lexra and picoTurbo). Both companies have been shut-down and their clients transferred to MIPS/ARM.

At the time Jiri Gaisler said: "More than ever, I'm happy with the decision to go SPARC. And many thanks to Sun and SPARC International for the open license!"

Jiri will show how this message still stands today, while we are witnessing similar choices being done in commercial world, where ‘open hardware’ might fuel a revolution similar to that of ‘open software’.

Jiri Gaisler is the founder of Gaisler Research and the developer of the open-source LEON SPARC processor. During 1988 - 2000, he worked for the European Space Agency as a staff researcher, developing the first European 32-bit processor for space (ERC32) and the fault-tolerant LEON-FT processor. In 2001, Jiri founded Gaisler Research, which develops and markets processors and IP cores for both space and terrestrial applications. A large part of the IP portfolio is provided for free in open source, for the benefit of research and education.