



7S Industry for Science (I4S)

Eduardo Ros (eduardo@sevensols.com)

Javier Díaz (jdiaz@sevensols.com)

Outline

1. Introduction to the company: 7S services and products. Industry for Science. Capacities and expertise
2. Open Hardware motivation for 7S
3. Open Hardware: pros and cons
4. Discussion

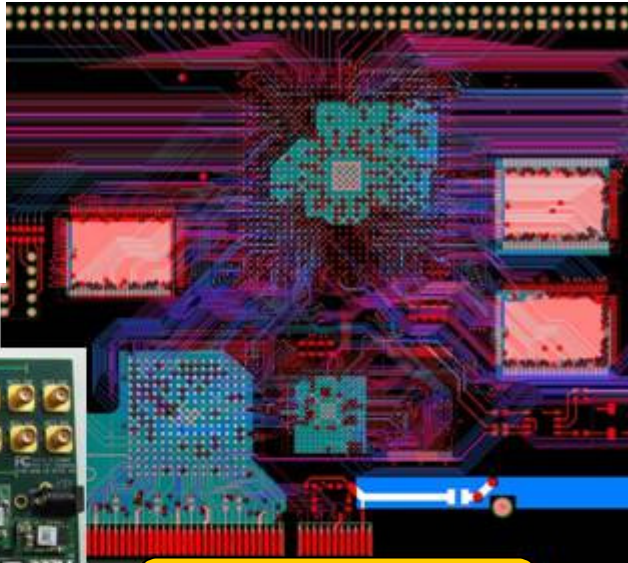


Introduction to the company:
7S SERVICES AND PRODUCTS

7S expertise

- **Technology based company specialized in:**
 - **Embedded software and hardware**
 - High performance PCB design
 - Firmware (Efficient DSP/GPU, microcontrollers and FPGA programming).
 - Safety-critical and dependable system design (certification)
 - **Reconfigurable hardware (FPGAs)**
 - High performance design techniques
 - SoC and Codesign
 - IP-core design
 - High-level synthesis
 - **Real-time signal processing**
 - Real-time data analytics
 - Computer data processing algorithms acceleration
 - Embedded data processing system

Company products & services



FPGA based boards



IPcores

Company products & services

▪ Products

- Own FPGA platforms: able to design FPGA processing boards and systems (XircaV4, S400, SB)
- Custom electronic products: PCB design (general electronics).
- IP cores (on-chip architecture, IP-core design and verification).

▪ Services

- High-tech consulting & Advanced technical training
- Electronics boards design and fabrication
- Embedded and real-time software development
- **HW/SW Certification** (DO-254, DO-178, IEC-61508 or IEC-26262)

Collaboration policy

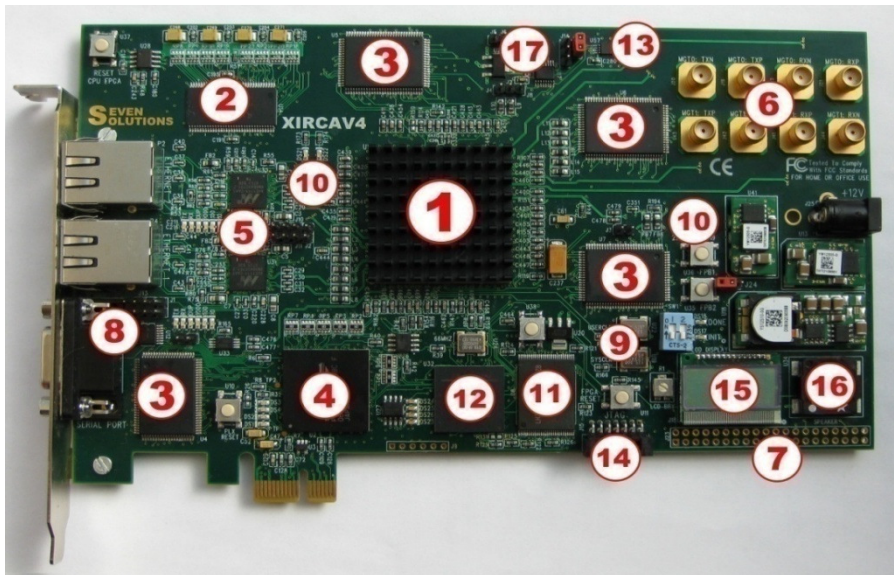
- Subcontracting policies. Towards a service beyond subcontracting.
 - Open design and support for the customer (all materials are provided for the customer to make the full design available)
 - Flexibility in specifications and design cycle
 - Context of the design: Assimilation of previous designs by the customer.

7S Company

- **Industry for Science**
- Participation in diverse research projects (subcontracted by research institutions or as partners → **RECOMP (EU grant), etc..**)
- Working team: high ratio of specialized Engineers and doctors.

Passion for challenges!

Xirca V4

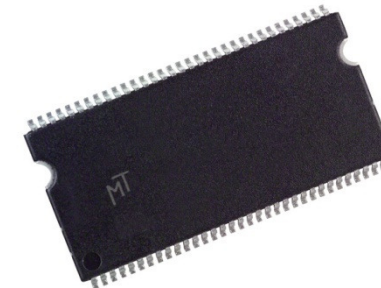
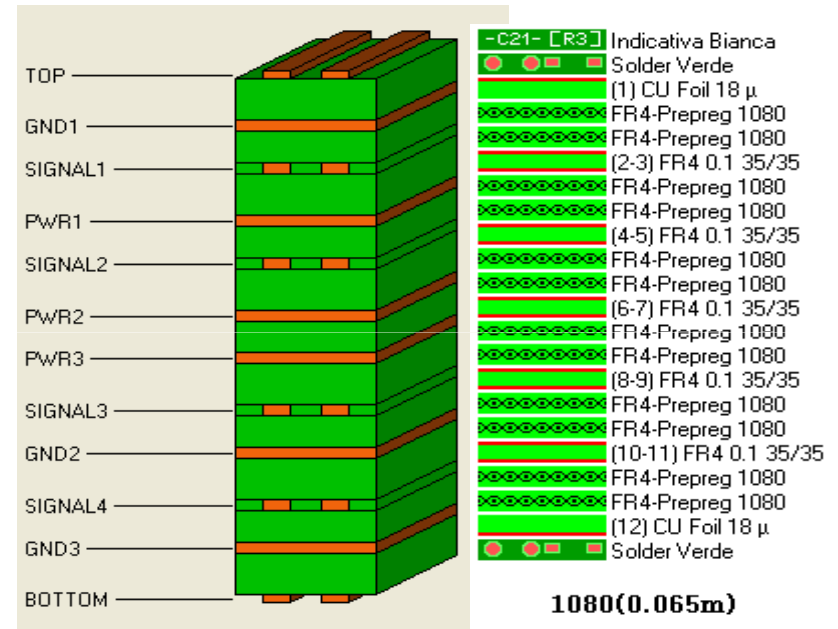


- 1) **VIRTEX-4 FPGA** (XC4VFX100-10FFG1152).
- 2) 2 independent banks of **DDR SDRAM** (512Mb).
- 3) 4 Pipelined **SRAM** memory chips 72-Mbit.
- 4) 1 **PCI Express** port 1x.
- 5) 2 tri-speed **Ethernet PHY transceiver** 100/1000.
- 6) 8 SMA connectors connected to 2 **Rockets IO**.
- 7) 20 expansion pins.
- 8) 1 RS-232 Serial port.
- 9) 1 User clock, 100 MHz and 125 MHz.
- 10) 2 LEDs y 2 push buttons.
- 11) 2 Flash memories (32MB) connected to CPLD.
- 12) CPLD to arbitrate the local bus.
- 13) 4-Kb IIC EEPROM.
- 14) 1 JTAG configuration port.
- 15) 1 LCD display: 2 lines x 8 characters.
- 16) 1 Buzzer.
- 17) IIC Fan Controller.

Xirca V4

Technical characteristics

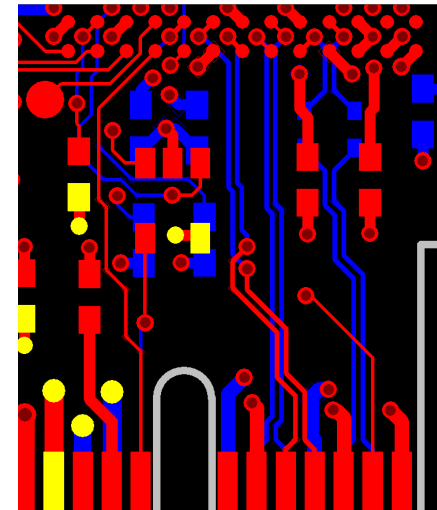
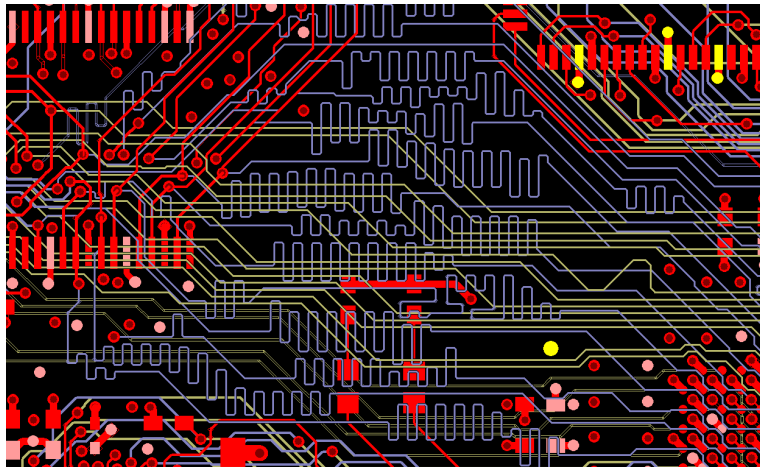
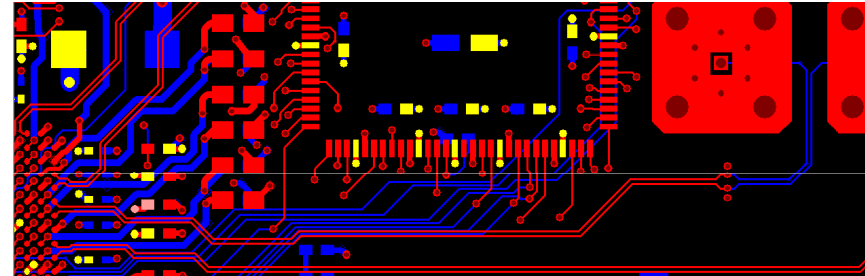
- 12 layers
 - (6 planes and 6 routing layers)
- Minimum separation between paths: 0.095mm
- 1.6 mm thickness
- 3654 drills
- 9 different internal voltages
- Encapsulated technology used:
 - **Flip Chip BGA (FF1152)**, separation 1.0mm
 - **CSP (Chip Scale Package)**, separation 0.5mm
 - **TSSOP, TQFP**, separation 0.6mm



Xirca V4

Technical Characteristics

- **Controlled impedance** (DDR, ZBT, Ethernet Gigabit, PCI-express, MGT RocketIO...):
 - 50 ohms (single traces).
 - 100 ohms (differential pairs).
- Signal Integrity simulations (Hyperlynx):
 - LineSim
 - BoardSim
 - Ussing IBIS models
- **Paths length control** (DDR, Differential pairs).



IP Cores design

- High expertise on FPGA IP cores design.
 - VHDL/Verilog for circuits description.
 - High level languages descriptions based on ImpulseC or SystemC for improving productivity and time-to-market.
- Testbenches for verification.
 - Monitoring mechanisms are also possible in case of requiring test during run-time .
- Accurate functional software models for accuracy validation (including bit-width quantization analysis if necessary).
- IP cores generation & docs for certification purposes.

WR6 board: under development

- Collaboration with CERN (tractor institution).
- High performance Virtex-6 platform (XC6VLX130T, XC6VLX240T and XC6VLX365T chips)
 - ARM processor (AT91SAM9263) included for software engineers productivity acceleration.
 - Specifically designed for high speed connectivity.
 - Large number of IOs availables for peripheral boards.
 - Dependable platform → certification

– It will be available as an open hardware platform on Q1 2012!

- Please contact us for additional information

Industry for Science

Creating Technology

**SEVEN SOLUTIONS AT
OPEN HARDWARE**

OH motivation for 7S

- 7S created its own products in its first stage (2007)
 - High performance data processing boards based on FPGAs
- 7S had little success with this kind of products
 - No powerful/international commercial/marketing effort
 - Technology is only 20% (maximum) of business success (who you know, where your are ...; are important success opportunity factors)

Learn fast or die

- Thus “*we were open to open hardware*”
 - Provided that design cost were covered (by subcontracting or as post-design provider with certain guarantees)
- We think now even in opening our “own products” to gain major visibility

Open Hardware

- Several Advantages
 - General Hardware design forum/niche (OHR). Necessities meet engineers addressing shared designs.
 - For small engineers based companies. Reduction of engineer idle times.
 - Access to other developments beyond your company expertise.
 - For instance White Rabbit includes embedded software, HDL, PCB. Seven Solutions have been mainly responsible of PCB board but it has access to the whole project material.

Open Hardware

- Disadvantages
 - Too dynamic environment. Some companies pop in and pop out.
 - There is no integral product maintenance, unless a company interiorized all the subparts of a global project.
 - Quality certification and trust.
 - The design may have been distributed, therefore even if there are traceability marks, global quality is difficult to asses. **This needs an initial pioneer customer** (such as CERN to gain credibility of usage).
 - Different Inter-companies interdependencies. Beyond a *joint venture*.

Walking together makes friends

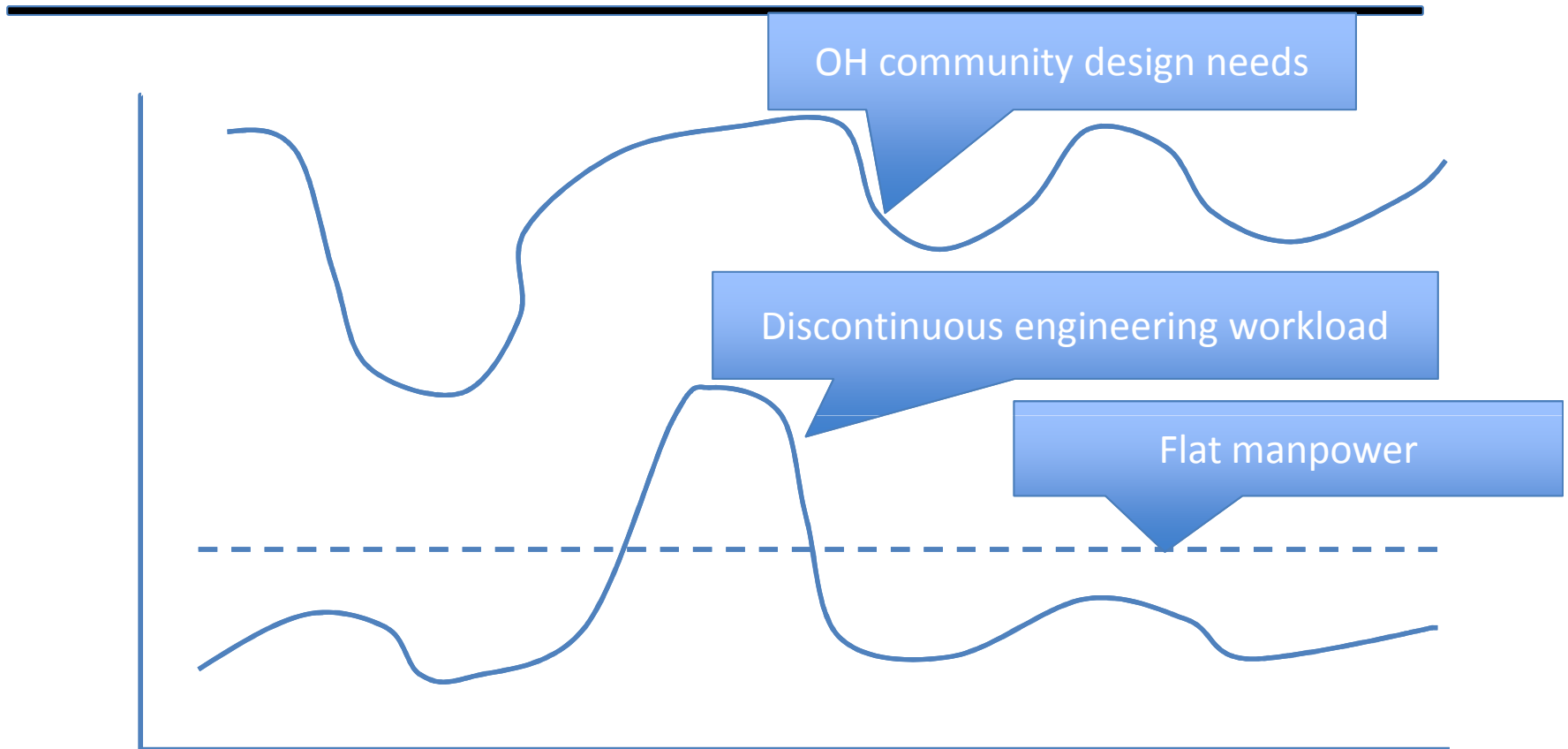
- *First joint venture:*
 - White Rabbit relationship between partners is rather central
 - Through CERN.
 - Future ventures *you know better each other*, preferred roles and technological competences
 - Will this lead to future joint ventures?
(there is the danger of heavier paper / bureaucracy load for a distributed effort than for a single large company)

Different motivations for OH

- A **small company** may want to gather higher visibility by opening its designs (for instance, 7S is thinking about making open FPGA high performance processing platforms)
- A **research institution** may want industrial partners to support its developments. Support for external customers is not an easy task for a research partner
- A **research institution** may want to spread its developments to the general community. Close intellectual property may not have sense without exploitation plans or partners

Need of an exploitation plan

- Potential roles of companies:
 - *Active designers*
 - *Actual vendors* (though not always original designers)
 - *Customization*
 - Broader support
 - Active role in searching for new application fields beyond research



A general community may help to regularize manpower and engineering workload

Buisness model beyond design

- Exploitation of the White Rabbit technology
- Support of equipments
- Spread technology to other application fields
(here larger companies with own market play a key role)
- Customization of open hardware designs
 - For instance, Seven Solutions (7S) is trying to test the White Rabbit hardware in the framework of safety critical systems (in RECOMP EU project)

Open Hardware. Discussion

Pros and cons

- Motivation for research institutions (external support and know-how spread)
- Potential roles of companies (active designers, actual fabrication and vendors, support, exploration of other application fields)
- Need of a tractor institution:
 - May partially or totally fund the design process (know how development)
 - First pioneer customer assess credibility on the whole product



Eduardo Ros (eduardo@sevensols.com)

Javier Diaz (jdiaz@sevensols.com)

(+34) 958 285 024

www.sevensols.com

C/Baza, parcela 19 Nave 3 \ P.I. Juncaril \
18210 – PELIGROS – GRANADA - SPAIN