Industry Experience from CITI alumni

Citi's Phd Day, 30th April 2015

Nicolas Brunie, Kalray

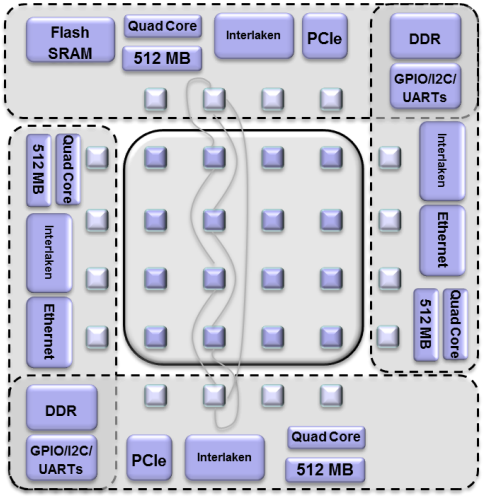
Experiences

- Internship at ENS de Lyon's LIP, (Feb-July 2010)
- Internship at Kalray, (Sept 2010-March2011)
- Phd CIFRE at Kalray/LIP/CITI, (started April 2011)
- Internship at Intel (MKL Team, Portland, OR), (April-October 2013)
- PhD in computer science, (May 2014)
- HW/SW engineer at Kalray since May 2014

Kalray

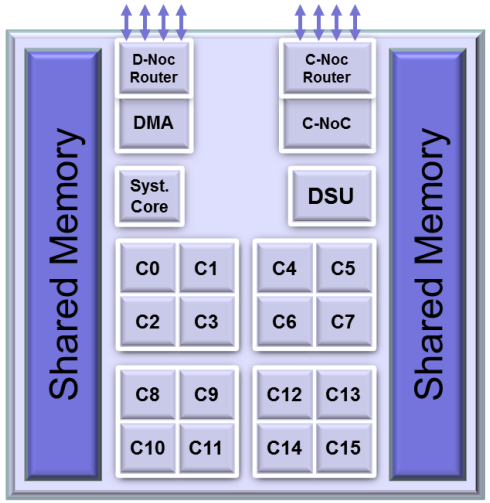
- Company founded in 2008,
  - Offices in Paris, Grenoble
  - Spin-off from the CEA
  - Extended to Japan and the US
  - 50+ people, mostly engineers (and a quite a few PhDs)
- Develop and sell the MPPA
  - Multi-Purpose Processor Array
  - 256-core chip dedicated to Networking, video and eHPC
- R&D oriented
  - 3 PhD finished, 3 in progress
  - Research projects (MCL, CAPACITES …)

Kalray's MPPA

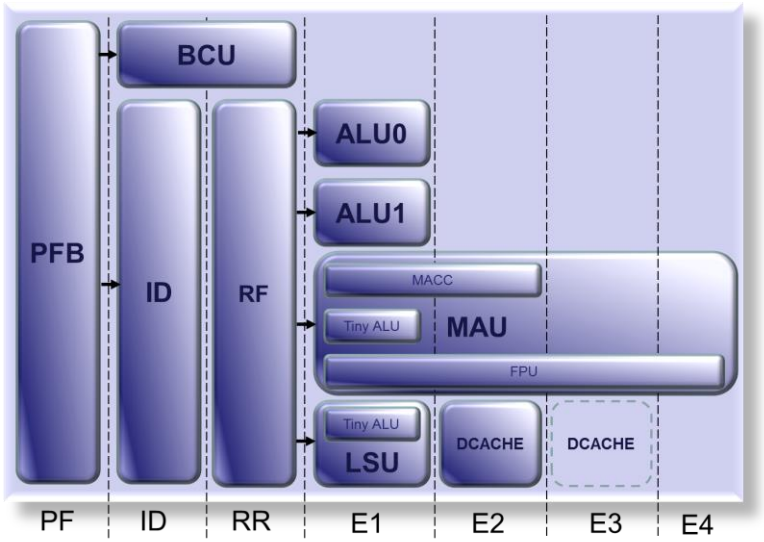


- Manycore chip
- 256 K1 processing elements
- 16 clusters embedded in a NoC
- Distributed memory architecture
- Fast I/Os : DDR, ETH, PCI-E, IK

- Andey released in 2012
- Bostan to be delivered summer 2015
- Coolidge development starting



K1 Core



- Proprietary ISA
- 5-issue VLIW
- 4-stage execution pipeline
- IEEE-754 compliant

- Beefed up between Andey and Bostan
  - Double Precision FMA, SIMD Single Precision
  - Video specific instructions
  - Networking load balancer, Crypto-accelerator
  - Improved Integer performance

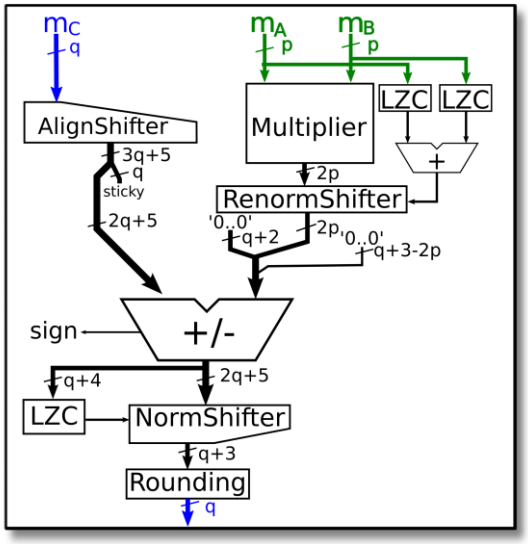
Post-Mortem: PhD in the industry

- Phd was a great opportunity
  - Unique experience as every PhD
  - 3-year research on a narrow technical subject
    - Hard to get in day-to-day industry jobs
  - Freedom to organize your work, your time
- … with a lot of challenges
  - Publishing
  - Staying focus on subjet

Post-Mortem: PhD in a start-up

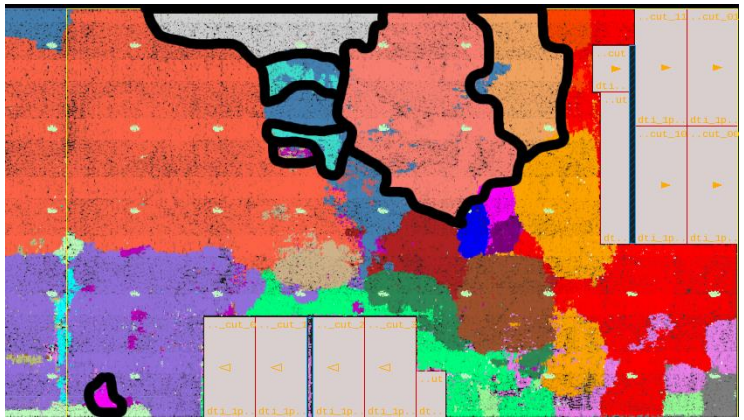
- Opportunities
  - Small companies give many opportunities:
  - Your interest matters:
    - Hardware FP design, Software FP development
    - HW/SW cryptography
    - Compiling
  - Your ideas matter
  - Easy to accumulate responsibilities and experiences
- Financial uncertainty
  - Start-ups are delicate entities (receivership)
  - Hard to ensure 3-year PhD financing from the beginning

Post Mortem : practical experience 0

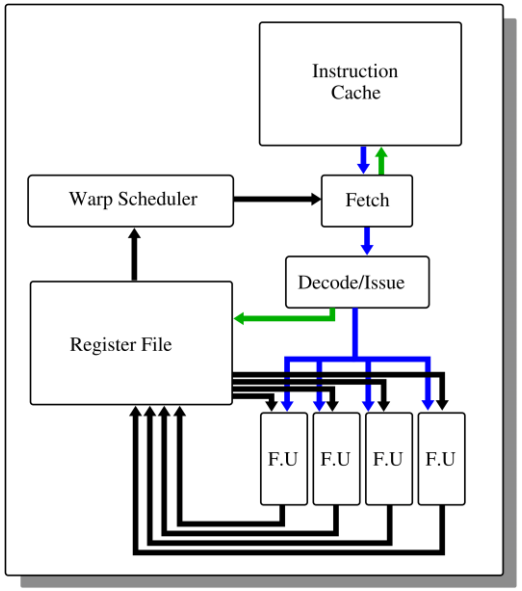


- Floating-point unit design
  - Started with research
  - Followed by development
  - Ended with Product Integration

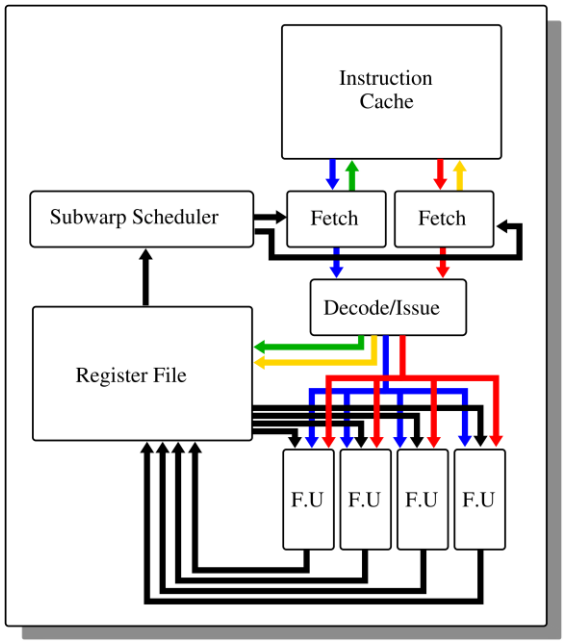
- Results :
  - K1’s FPU
  - One Patent
  - One Article



Post Mortem : practical experience 1



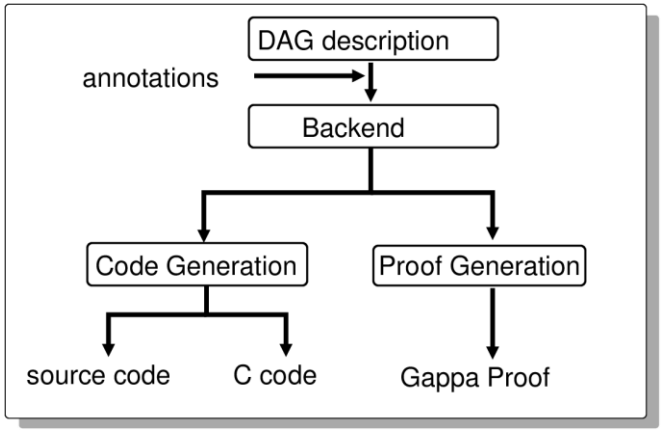
- NIMT architecture
  - Started with research
  - Followed by simulation
  - Ended with Happiness



- Results :
  - One Patent
  - Two Articles

Transition project: Cularo's Metalibm

- Software project started during the thesis
- Forked 3 times
- Integrated into ANR Metalibm
- Continued after the thesis
- Colloboration between LIP6, DALI, CITI, CERN, Kalray …



- Code divided towards collaboration
  - Public repo for core
  - Private repo for Kalray specifics
- Already in production
- One new article
- Many results have yet to come

Present days : Doctor in the industry

- More work than ever
- Still trying to finish research started during my thesis
  - Help keeping a foot in the « research » door
- Starting new research projects (Metalibm)
- Surprised to see how fast things change
  - One year ago I was where you sit
- Happy to share my experience

Conclusion and future work

- CIFRE: Bridge between public research and industry
  - Easier to get in the industry
  - Harder to get back to public sector
  - Make sure to work with both during your thesis
- Industry is no longer a dark place
- Collaboration is key
  - Use your position

If you are interested in pratical applications (and no vacations) then industry might just be your place

KALRAY

Thank you. Questions ?

Appendix

Use your environement

- Benefit from each collaboration
  - You are surrounded by interesting people
  - Every collaboration can end with a paper
- Benefit from CITI's links with the industry
  - Getting closer to the industry, early on, is a plus, especially if you are interested in practical domain (real life applications)
  - Never forget that Phd is research (above all)
    - Very important to publish
    - Prepare your post-doc