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Interview with PullNano project coordinator

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NanoCMOS, the European Union's first integrated nanoelectronic research project, has just passed the torch to its successor, PullNano. In an interview granted to *EETimes.fr*, Gilles Thomas, PullNano project coordinator, commented, briefly but accurately, on the transition from NanoCMOS to PullNano before stating the specific expectations of this new project dedicated to overcoming the obstacles to 32 and 22-nanometer development as quickly as possible.

NanoCMOS, the European Union's first integrated nanoelectronic research project, has just passed the torch to its successor, PullNano. Dedicated to taking the final steps in miniaturization and preparing the 32-nanometer generation, this project will span 30 months with a 25 million euro subsidy ($31,6 million) from the European Commission. PullNano brings together 35 European partners and strengthens cooperation between the Dresden (Germany), Grenoble (France) and Leuven (Belgium) research centers.

PullNano Project coordinator Gilles Thomas

In an interview granted to *EETimes.fr,* Gilles Thomas (in photograph), the PullNano project coordinator, commented, briefly but accurately, on the transition from NanoCMOS to PullNano before stating the specific expectations of this new project dedicated to overcoming the obstacles to 32 and 22-nanometer development as quickly as possible.

EETimes.fr: The European Commission spent 24.1 million euros ($30,4 million) on the NanoCMOS project, undertaken in 2004 to demonstrate the feasibility of CMOS 45-nanometer logic process technology. Could you explain what convinced the European Commission to continue funding PullNano?

Gilles Thomas: Because funding of the NanoCMOS project was a resounding success and generated many benefits for industrial partners and SMEs, particularly modeling software editors, the European Commission wanted to continue the same process at a time when developers are getting close to the ultimate CMOS.

Since NanoCMOS, Europe has grown and now has a greater need for resources and strengths. Europe has considerable university expertise, which it can leverage to run promising research departments concurrently and ensure that the research is applied quickly.

EETimes.fr: The PullNano project involves 35 partners in 12 European countries, with a stronger mobilization of university resources. Could you comment on this collaborative approach to European nanoelectronic research?

Gilles Thomas: I must first point out that none of the partners left between the NanoCMOS and PullNano projects, so it proves that NanoCMOS had the benefit of good management.

PullNano has effectively opened up to university research with the participation of 17 European universities, including the University of Warsaw, University of Newcastle, University of Liverpool, Catholic University of Leuven, University of Athens and University of Savoie. A specialized department has been created in each university. The university laboratories will give the industrialists and all of the project's partners the computing power, mathematical and physical models as well as physicochemical characterization methods they lack.

It is an opportunity to really mobilize Europe so it can avoid falling behind in information technology. Forming such an alliance and working together on matters directed by industrialists means that academic research is turned towards application. In the past, research funding was allocated to labs with few economic benefits. We are now in a position to rally university brainpower around applied research.

EETimes.fr: Is there an exchange program for the students of these various European universities?

Gilles Thomas: No student exchange program is planned. However, there is what we call "project training", which includes courses, conferences, summer schools and seminars.

EETimes.fr: The PullNano project was initiated on June 1, 2006. A kickoff meeting was organized recently. Could you remind us of its objectives?

Gilles Thomas: It concerns implementing the project. Approximately sixty people got together on Monday, June 12th and Tuesday, June 13th to define each sub-project and validate the European Union's plan.

A schedule has already been prepared with milestones. Among other examples, I should mention a working 32-nanometer demonstrator on a 32-nanometer SRAM. We plan to conduct initial trials quite soon so we can identify the limitations and decide if major technological enhancements will be needed because the 32-nanometer node will likely be a pivotal generation with a lot of new applications that are hard to implement at an industrial level. The 32-nanometer node—not the 22-nanometer node—is seen as pivotal.

From an industrial standpoint, the benefits will spread from the 32-nanometer to the 22-nanometer nodes. We are presently working on moving the technologies to a 12-inch wafer. Integration has become difficult because we are up against atomic layers. We are struggling with quantum physics.

EETimes.fr: What can we expect after PullNano?

Gilles Thomas: After PullNano, we are banking on a MEDEA funding type of development, which should occur at the end of 2008. As regards subsequent technologies, we think a 16-nanometer node will exist, so we plan to conduct a 22 to 16-nanometer project. The next level should then be the 11-nanometer node, but that will only be possible if extreme ultraviolet is an industrial technology.

I should clarify that the industrialization at the 32-nanometer node with finished products on the market will not be seen until 2012 and that the industrialization at the 22-nanometer node will not see the light of day until 2015.

Approaching the 10 and 11-nanometer nodes means entering a very difficult area of physics. The electron to go from the source to the drain, or even the electron's mean free path, is the order of magnitude of the grid size. The industrial side is where the difficulty lies. These technologies must remain economical if they are to be sold, so the problem will be economical more than technological.

EETimes.fr: How do you relate research to industry?

Gilles Thomas: European funding efforts provide the seed money for initiating a project and helping it establish the technology's feasibility. Following that are projects like Eureka to take the research to the industrial sector. In the case of NanoCMOS, 45-nanometer technology will be introduced onto 300 mm wafers under the Medea+ Foremost program. This program, implemented on January 1, 2006, brings together three major European industrial concerns: Infineon, Philips and Alliance Crolles2. The industrialization of NanoCMOS as a finished product for the market is expected for late 2008-early 2009.

EETimes.fr: Are you aware of any other project similar to PullNano in the world? If so, would you establish research ties with it/them?

Gilles Thomas: Although no other program brings together so many nationalities, the Albany NanoTech research center in the US should be mentioned. No formal cooperative relationship exists with PullNano, but some players are working on PullNano as members of the ITRS (International Technology Roadmap for Semiconductors) international consortium of businesses.

EETimes.fr: What is France's place in the PullNano project?

Gilles Thomas: France is the country getting the most contributions. Indeed, all the French partners are getting 47% of the total budget, which is nearly double that of the next country.

EETimes.fr: How do you explain that?

Gilles Thomas: The preeminence of the Grenoble pole has allowed France to secure a major part of the funding. With the presence of Crolles, the French Atomic Energy Commission (CEA) and the French National Center for Scientific Research (CNRS), Grenoble is attracting attention. Minatec is also playing a very positive role. Pooling academic, industrial and research strengths into a single site guarantees greater effectiveness. Many people will be working on the Minatec and PullNano projects at the same time.

EETimes.fr: Do you think PullNano might help reverse the French brain drain?

Gilles Thomas: There is no evidence of that, but it should prevent brainpower from leaving. Europe does not always have a sufficient ecosystem to keep people. If they had better conditions abroad with access to investment funds and a more fertile environment, there is no way French brains would want to return to France.

On the other hand, we can look forward to international firms setting up operations in France. The US company, Freescale, is the best example, and it is not impossible that AMD will one day invest in research in Europe, alongside its manufacturing sites.

EETimes.fr: Thank you so much for your time.

Gilles Thomas took over from Guillermo Bomchil as coordinator of the NanoCMOS and PullNano projects in March 2006. Mr. Bomchil announced his retirement at that time.

Gilles Thomas has a Ph.D. in Solid-state Physics from the University of Grenoble. His first forays in the professional world were at Materials Research Corporation (MRC) and then Matra-Harris Semiconductors. In 1987, he joined Thomson-CSF, which then became STMicroelectronics. He has held many R&D positions (development of BICMOS technology) in ST

manufacturing units in Europe (Grenoble and Crolles), the US (Carrollton, Texas) and, more recently, as technical director of the AMK6 Singapore unit.

He has authored many publications and has seven patents to his credit.