What´s next...

M. Graef
Strategic Programme Manager
TU Delft, Delft, Netherlands

Biography

Mart Graef is strategic program manager at the faculty of Electrical Engineering, Mathematics and Computer Science at Delft University of Technology (TU Delft) in The Netherlands. In this position, he develops technology partnerships with companies, institutes and universities, often within the framework of national and European cooperative projects. He participates in initiatives aimed at defining strategies and technology roadmaps in nanoelectronics, such as NANO-TEC, ENI2 and the ITRS. He is a member of the International Roadmap Committee, which guides the International Technology Roadmap for Semiconductors (ITRS). He is the chair of the ENIAC Scientific Community Council and participates in the AENEAS Support Group. Mart Graef received a PhD in Solid State Chemistry from the University of Nijmegen, the Netherlands, in 1980. Subsequently, he joined Philips Research, where he held various positions in Eindhoven (the Netherlands) and Sunnyvale (USA) as a scientist and manager in the field of semiconductor process technology. He was strategic program manager at Philips Semiconductors and NXP until 2009, when he joined TU Delft.

Wearable electronics

P. Moynagh
VP of Internet of Things Group (IOTG) and General Manager of Intel's Quark Solutions Division
Intel Corporation, Dublin, Ireland

Abstract

T B A

Biography

Philip is VP of Internet of Things Group (IOTG) and General Manager of Intel's Quark Solutions Division. Designed in Ireland, the Quark System on Chip and its Software Stack enables us to move past an Internet comprised primarily of connected Computers, Tablets and Phones to an Internet that connects Everything in the physical world (including everyday objects). Widely referred to as the "Internet of Things", this technology is transforming high technology businesses today. Brussels, Beijing and Washington predict that Billions of Things will have built-in Connected-Compute by the close of this decade, and that they will create Trillions of Euro in economic value. Philip's organisation identifies transformation opportunities, translates them into silicon and software architectures and builds real world solutions. Prior to this role, Philip managed multi-Billion-Euro silicon chip fabrication factories in Ireland and the US. He is married to Claire, has three children (Niamh, Ciara and Cian), and lives in Dublin.

Convergenece of Nanoetchnologies for the Ambient Living Applications

J.M. Kim
Professor (Chair) of Electrical Engineering
University of Oxford, Dept og Engineering Science, Oxford, United Kingdom

Abstract

We present the current and future nanotechnology convergence, especially focusing on the convergence of nano with
electronics, display and photonics, and energy/bio areas.
Nano-electronics will cover the graphene and carbon nanotubes, and their applications in flexible and transparent
electronics, and future medical imaging system.
Nano-photonics will include flexible quantum-dot TVs, smart lightings, future LED on the glass, and 3D nano active
hologram displays and auto color change.
The energy with nanotechnologies will be including high power energy harvesting and future solar cell.
Nano-bio areas will cover nano bio sensor networks for the bio system with invasive and noninvasive methods.
In addition, the auto fragrance system will be demonstrated for the future living.
The textile electronics will be introduced for the future electronics, optics, and energy and sensor networks for smart and
ambient assistant living.

Biography

Professor Jong Min Kim was formerly Senior Vice President and Vice President in Samsung Electronics Corporate R&D Centre (Samsung Advanced Inst of Technology) and Samsung SDI, Korea for 13 years. Now, he is Professor (Head) of Electrical Engineering of Department of Engineering Science at University of Oxford since 2012. Professor Kim had previously held a variety of senior technology positions at the Samsung Group including Display and LEDs, Materials, Energy (Batteries and PVs), Nanotechnologies, and Electronics research/developments. Professor Kim had managed several major projects in Samsung for 17 years and others(LG Electronics, e-Magin (East Fishkill, IBM) and else for several years. His research is described in more than 300 journal papers (including 8 Nature/Science, and Nature family journals), 250 publications on the Technical Digest and proceedings with around 100 keynote/invited speech at major international conference, and 253 patents (153 international patents). He received a number of awards: Best Paper Award, the Gold Prize Award by Samsung Group Chair, Prime Minister Awards (2001), Awards by Minister of Science (2000), and recently Awards by Minister of Knowledge/Economy (2012) from the Korean government. He was responsible for a number of world first inventions: carbon nanotube (reported variously in Science, Nature, etc. One paper is with more than 1,000 citation); transparent and flexible graphene electrodes (Nature 2009, with more than 3,000 citations) and quantum dot based LEDs and Displays (Nature Photonics, Cover Article, 2009 and 2011, Nature Comm'13), LED on glass (Nature Photonics, Cover Article, 2011), CNT network Transistors (Science 2008 and Nature Communications 2011), and many others. Amongst his professional achievements Professor Kim was Chair, Samsung Group Technology Conference (>1,000 papers, 2004-06, 2010-11); Member, Evaluation Committee for R&D Centres of Seoul National University (2008-9); Int. Advisory Board Member, Rus Nano Prize in Russia (2007-present), and technical committee of IEEE Int. Conference (IVNC, MTT), LOPE-C, ICFPE, etc. He had managed many high technology trans-national projects including the EU project-Takoff (FP 6 project-IST2000-28519, 10.5 m), 8 million dollars project on Creative Research by Korean Government, and more outside of Samsung: Stanford University (2003-2011), Dupont R&D Centre (2001-2006), 3M R&D Centre (2004-2010), Toray (2004-2011), Russian Academy of Science(1995~2011), the Chinese Academy of Sciences (2003-2010) and many academia. Now he is leading EU ETC Advanced Grant, FP7 and numerous project with international sponsorship at Oxford.

He had organised his selected publications in three groups.

1.Quantum Dots and Nano Materials for display/lighting, image sensors

His work on Quantum Dot materials and devices began in around 2002 when he turned the research subject from development of CL and/or PL phosphors to research on EL devices and various convergence technologies related to solar cells and batteries. Based on nano-phosphor technology, he had found various new QD materials, structures and devices.

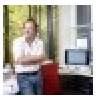
2. Nano Carbon and Electronics for flexible electrode, TFT, photonics, and sensors

His interests in nano carbon such as CNTs and Graphene and their applications go back to 1998. As an ideal electron emitter, CNTs have been studied at the early stage of my nanocarbon related work from 1998 to 2004 then he had published more than 100 papers on nanocarbons and their applications. Nano carbon has been one of key subjects over his research career and it is still one of major focus of his group's work.

3. Display, New Energy, and Medical Imaging System

Display is one of another research bases. From early 1990's, he had developed a number of display devices and systems such as FED, OLED, LCD, Laser TV, 3D TV, LED, PDP, flexible displays. He also had initiated various energy devices such as LIB, flexible battery and various types of solar cells (OPV, CIGS, DSSC and quantum dot PVs) at Samsung Electronics and it has been the framework of display and energy business of Samsung. He also has been leading research on the multi dose X-ray, and Tera Herz imaging system for future Samsung business, as well.

Quantum Computing : the engineering challenges



K. Bertels
professor
Delft University of Technology, Computer Engineering, Delft, Netherlands

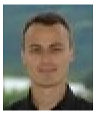
Abstract
The challenges to build a quantum computer are enormous and can be separated in physics and engineering challenges. The physics challenges focus on the coherence time of the superposition and entangled state of qubits and on defining ways to increase the fidelity of the qubit states and to compensate for the errors that occur during the quantum operations. The engineering challenge can be summarised by the word `scalability'. For instance, it has been stated that in order to apply the famous factorisation algorithm developed by Shor, it is expected that around 5 billion physical qubits are needed to factor a 2000 bit number in a reasonable time (expressed in number of hours). Knowing that the largest number of physical qubits one is capable today of creating and controlling is less than 10 it immediately becomes clear that several breakthroughs are needed to achieve the goal of building a quantum computer. The engineering challenges are thus focused on this scalability as the qubits need to be controlled, manipulated and corrected such that the exponential computing power is preserved.

The quantum state and therefore the (entangled) qubit state is very fragile. Any small interaction with the environment causes a bit-flip or phase shift error and the superposed state to decohere. In addition, a quantum state cannot be measured directly without destroying the superposition. This destructive reading as well as the duration and fragility of the superposition (decoherence time) are the achilles heel of quantum computing and one of the main challenges of any quantum computer as this qubit behaviour interferes in its correct operation.

In this talk, we will focus primarily on those aspects of building a quantum computer that are to a certain extent disconnected from the pure physics layer where one is focusing on building and improving the physical device. We focus on the system design challenges of a large-scale quantum computer.

Biography
Koen Bertels is chair professor and head of the CE Laboratory where 6 faculty members and around 30 PhD students perform research in the domain of multi/many core architectures, Electronic System Level design and dependable Nano computing. His research focuses on hardware/software co-design for heterogeneous multi-core platform and he investigates alternative computing architectures and technologies such memristor based computing and quantum computing. He is a principal investigator for architectural design in the TUDelft recently created quantum research lab, QuTech.

Silicon photonic technology developments towards higher 2D and 3D integration level with microelectronics



C. Kopp
Head of the laboratory of CMOS Photonics
CEA, Leti, DOPT, Grenoble, France

Abstract

Optical communications are definitively playing a major role in high speed interconnects in servers, datacenters, and supercomputers. In these systems, copper cables have been replaced by active optical cables in order to deal with data rate typically above 100Gbps per module. Mainly based today on optical sub-assembly modules using VCSEL emitters, optical links remain an expensive solution. As a result, the next generation of optical components must meet the challenge of high speed, low cost, low energy consumption, and high -volume manufacturing. Silicon photonics appears as a unique opportunity to cope with this challenge, leading also to a convergence between photonics and electronics in terms of fabrication foundry, design tool environment, and circuit co-integration.

However, on this path towards the photonic and electronic convergence, integration challenges still remain. From die-to-die, to die-to-wafer and wafer-to-wafer integration. We present the main approaches we consider using copper pillars, trough silicon vias, and copper-copper direct bonding technologies in order to reach higher density with even smaller electrical interconnect pitches. The implementation of these integration technologies are then illustrated through various packaging scenarios applied to optical communication modules.

Biography

Dr. Christophe Kopp received the Ph.D. degree in photonic engineering from the University of Strasbourg, Alsace, France, in 2000, in the field of diffractive optics. Since 2001, he has been with the CEA, LETI,MINATEC Institute, Grenoble, France, where he is engaged in developing micro-optoelectronic devices. He has participated in several national and European collaborative projects (ODIN, HELIOS, WADIMOS MICROS, SILVER, MINAPACK). In connection with industrial companies (Intexys Photonics, IIIV-lab Mapper lithography), he has been responsible for several R&D projects. To support national SMEs (ULMER, SES, Wavelens, LGE, AEROTEC), he participated in appraisals. He is the author or co-author of more than 30 papers in scientific journals and international conference proceedings, one scientific book, and more than 30 patents. Currently, he is at the head of the laboratory of CMOS photonics with 30 research engineers/technicians and 6 PhD students.