# KITAKYUSHU

## Kitakyushu Human Technology Cluster

### Outline of the Project

Kitakyushu's cluster-based economic development initiative is built around idea by combining high-technology knowledge from institutes in the KSRP (Kitakyushu Science and Research Park), a long-term build-up of production technology, and expertise of businesses in Kitakyushu area. This project develops innovative knowledge-based clusters which will create new leading businesses on system LSI and Micro-Nano technologies to provide solutions for improving quality of life and environmental issue in 21st century through University-Industry-local Government collaboration.

### Members of the Headquarters

○President…… SUEYOSHI Koichi (Mayor, The City of Kitakyushu)
○Project Director…… GOTO Satoshi
○Research Director…… KUNITAKE Toyoki (Vice President, The Univ. of Kitakyushu)
○Science and Technology Coordinator… KAGEYAMA Takao

### Central Project Organization

FAIS (Kitakyushu Foundation for the Advancement of Industry, Science and Technology)

### Core Institute(s)

Kyushu Institute of Technology
The Univ. of Kitakyushu
Waseda Univ.
The Univ. of Tokyo

### Participants

Industry…Nippon Steel Chemical Co.,Ltd., Hitachi ULSI Systems Co.,Ltd., NEC Corporation, Mitsubishi Electric Co.,Ltd., Others

Institute…Kyushu Institute of Technology, The Univ. of Kitakyushu, Waseda Univ., The Univ. of Tokyo, The Univ. of Kyushu, Nara Institute of Science and Technology, Tokyo Institute of Technology, Others

Government…The Institute of Physical and Chemical Research National Institute of Advanced Industrial Science and Technology (AIST) Kyushu Center, Others

### Main Researchers

<System LSI>
SASAO Tsutomu (Prof., Faculty of Computer Science and Systems Engineering, Kyushu Institute of Technology)
NAKAMURA Kazuyuki (Associate Prof., Center for Microelectronic Systems, Kyushu Institute of Technology)
KIMURA Shinji (Prof., Waseda Univ. Planning Office for the Graduate School of Information, Production and Systems)
NAKATAKE Shigetoshi (Associate Prof., Faculty of Environmental Engineering, The Univ. of Kitakyushu)
OHTSUKI Tatsuo (Prof., School of Science and Engineering, Waseda Univ.)
TOGAWA Nozomu (Associate Prof., Faculty of Environmental Engineering, The Univ. of Kitakyushu)

<Micro-Nano Technology>
YOSHIZUKA Kazuharu (Prof., Faculty of Environmental Engineering, The Univ. of Kitakyushu)
NISHINO Norikazu (Prof., Graduate School of Life Science and System Engineering, Kyushu Institute of Technology)

## Outline of Researches

### ●New Structure LSI

In this research category, the study is focused on the development of new structure LSI circuitry, the device technology, and the architecture technology that help realize the next-generation system LSI enabling human interface. The elemental level of low-voltage and low-power-consumption circuitry, reconfigurable circuitry and fusion circuitry integrating micromachines (micro-electro-mechanical system (MEMS)) and RF elements with LSIs are representative research subjects. The researches under this project are directed toward nurturing and consolidating new elemental technologies applicable in creating next generation LSIs, whose achievements are stored as the competence core of the intelligence clusters in the Kitakyushu and Fukuoka areas (Kyushu Broad Area Innovative Cluster) and disclosed for furthering the conglomeration of technology and industry.

[Kyushu Institute of Technology, Waseda Univ., The Univ. of Tokyo, Hitachi ULSI Systems Co.,Ltd., Mitsubishi Electric Corporation, Exploitation of Next Generation Co.,Ltd., Others]

### ●Multimedia Processing

This research focus on the development of a variety of methods and systems for processing speech and image data with computers. To be specific, the research subjects in this category are 1) a micro interactive speech recognition system that recognizes speech input in a language, transforms it into the text format, translates and outputs it in another language, 2) (a) a system of automatically collecting information of human attributes (colors of the hair and skin, shape of the face, male or female, age, etc.), (b) an architecture to fuse analog and digital information and (c) an interactive image-filtering design system, 3) technology to create super real artificial space for speech and image using a high-performance LSI, 4) a remote image-monitoring LSI and 5) a safe, secure and easy-to-use information security system.

[Kyushu Institute of Technology, Waseda Univ., The Univ. of Kitakyushu, Matsushita Electric Industrial Co.,Ltd., Asahi Techneion Co.,Ltd., A-R-Tec Corporation, Kihara ironworks, Others]

### ●Application SoC

This research addresses the development of system LSI design technology and, as the basis of it, design automation technology. To be specific, research subjects in this category are 1) a system LSI specifically designed for ubiquitous information processing including secure communications processing, data retrieval, and summarizing, 2) a design automation technology for designing large-scale digital LSIs and 3) a design automation technology for designing mixed analog digital LSIs. The synergism of these research efforts helps level up the application SoCs not only in individual fields but also as a whole and increase the competitiveness of electronic technology-related businesses in the Kitakyushu and Fukuoka areas (Kyushu Broad Area Innovative Cluster).

[Waseda Univ., The Univ. of Kitakyushu, NEC Corporation, Mitsubishi Electric Corporation, SII EDA Technologies Inc., Others]

### ●Sensing Technology

This research addresses the development of special environmental information sensing systems including micro-analyzing system for the dynamic distribution of environmental materials in an ecosystem, quantitative sensing system for the time-space analysis of micro-pollutants and micro-sensing system for health care. In addition, developmental efforts cover an enzyme-affinity chip, a gene expression factor-affinity chip and a cell array chip, a specific cellular change detection technology, a micro-passage for the chips and functional chip integrated system that are instrumental in developing a bio-information sensing device. Also, the study is made for possible welfare, environmental and medical applications of the environmental information sensing system.

[The Univ. of Kitakyushu, Kyushu Institute of Technology, Nippon Steel Chemical Co.,Ltd., Shinnikka Environmental Engineering Co.,Ltd., Kokura Synthetic Industries, Ltd., Others]

### ●Microdevice

This research addresses the development of a ubiquitous intelligent sensing system, microdevice elements integration technology (sensor, pump, reactor, valve, passage formation, separation, analytical operation, battery, electronic circuitry, micromachine), Micro-Nano separation membranes, separation columns and separation reagents.

Environmental data acquired from a combined system of microdevice and sensing technology are diverse and complex both in space and time. Coupling the sensing technology with system LSI technology is indispensable to process those environmental data and recover useful information out of them.

[Waseda Univ., The Univ. of Kitakyushu, Nippon Steel Corporation, Kyushu Keisokki Co.,Ltd., Others]

## Expected Results

○Development of reconfigurable LSI
○Development of image and speech processing LSI
○Development of network LSI
○Development of environmental sensing system
○Development of LSI design system