Access
ETRI TECHNOLOGY REPORT
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ETRI
**Electronics and Telecommunications
Research Institute**

218 Gajeong-ro, Yuseong-gu, Daejeon, 305-700, KOREA
Tel.+82.42.860.6114 Fax.+82.42.860.5848 www.etri.re.kr

2012
ETRI
TECHNOLOGY
REPORT

Get creative

Electronics &
Telecommunications
Research
Institute

Get productive

ETRI

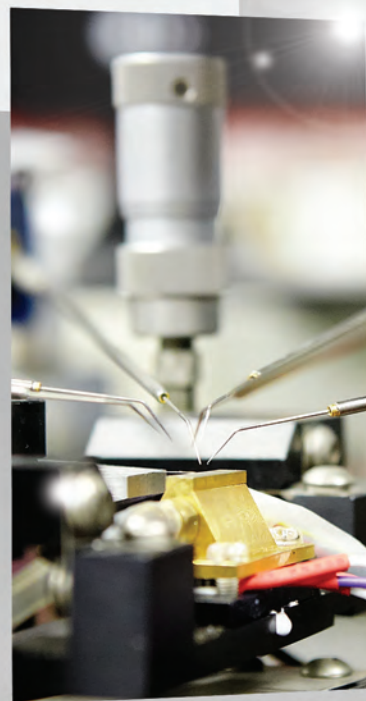Electronics and Telecommunications
Research Institute

2012
ETRI
TECHNOLOGY
REPORT

Contents

ETRI leads innovation of creative technology development
network through continuous challenges and unceasing efforts.
ETRI national leader of IT, opens the era of IT digital convergence.

ETRI implement enhanced life by creating and
disseminating value through technology.
ETRI is the pathway of hope linking people, object and the environment.

Message from
the President

ETRI will help humanity to realize a
"Smart World" that is more abundant,
convenient, and safe by creating harmony
between humanity, technology and
the environment.

Since its foundation in 1976, ETRI, a global IT research institute, has been making its immense effort to provide Korea a remarkable growth in the field of IT industry. ETRI delivers Korea as one of the top IT nation in the World, by continuously developing world's first and best technologies.

Korea, the wasteland of Science and Technology became IT leading nation through indomitable will and challenging spirit. In the 1980's, development of TDX(fully digital electronic switching system) realized one phone per house which brought significant changes to the everyday lives of Koreans. Successful development of 4M DRAM, Korea stated to dominate the world's semiconductor industry. During 1990's ETRI once again astonished world by commercializing CDMA for the first time in the world.

In 2000's ETRI developed Terrestrial DMB, WiBro, and 4G LTE Advanced which became the foundation of Mobile Communication. Recently, as national IT leader, ETRI is performing "communication" and "convergence" by developing SAN Technology (cutting-edge IT technology converging with shipbuilding), Korean to English world-class portable automatic interpretation technology, and development of adjustable display technologies, such as transparent display.

Building on its past success, ETRI continues to dedicate in R&D to maintain its place among world's best research institutes. With its vision of being "Smart & Green Technology Innovator", ETRI will continue to develop national strategy technologies, strive for the commercialization of growth engine technologies and to secure value creating intellectual property in creative and innovative ways for industrial development. ETRI, with its continuous efforts to develop creative and innovative technologies will lead digital convergence era of the world IT Industry.

ETRI will help the humanity realize a "Smart World" where people, technology, and the environment are interconnected to create a more abundant, convenient, and safe life. This is the future of ETRI.

Thank you.

PRESIDENT OF ETRI   *Heung nam Kim*

History

1977.12.10. KTRI Established
KECRI became independent from KIST and KTRI was established in Dec 31, 1976 as a research institute specialized in telecommunication

1976. 12. 30. KERTI Established
Established to perform research on Electric field

1981. 1. 20. KETRI Established
Established KETRI (consolidation of KTRI and KERTI)

1976. 12. 30. KIET Established
Established KIET to research in the field of electronics, e. g. semi-conductors, computers

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1976. Established KECRI, KIET, and KERTI, the origins of ETRI

1981. Established KETRI

KECRI was founded as an affiliate of KIST in Dec 31, 1976 for systematic research and development in the field of communication technology and introduction and development of "Electronic Switching System". Independent from KIST and renamed itself as KTRI in Dec. 10, 1977

In Dec. 30, 1976, KIET (Korea Institute of Electronics Technology) was established to research in the field of electronics, e. g. semi-conductors, computers

In Dec. 30, 1976, KERTI (Korea Electric Research and Testing Institute) was established to research in the field of electrics

In Jan 20, 1981, KETRI (Korea Electrotechnology and Telecommunications Research Institute) was established in consolidation of KTRI and KERTI

1996. 1. 1. SERI Established
SERI, which was opened as data process department of KIST, incorporated into ETRI as an affiliate in May 25, 1998

1985. 3. 26. ETRI Established
ETRI, institute specialize on Information and Telecommunication was established(consolidation of KIET and KETRI)

1997. 1. 31. ETRI, Institute's Korean Title changed
Renamed it as Electronics and Telecommunications Research Institute(ETRI) based on regulations for electronics and telecommunication

1985. Established ETRI

In March 26, 1985, ETRI, institute specialize on Information and Telecommunication was established (consolidation of KIET and KETRI) to meet with the emphasize on Electronics field

1996. Data process department of KIST transferred to ETRI as an affiliate

In June 27, 1967, SERI (System Engineering Research Institute) was opened as data process department of KIST, incorporated into ETRI as an affiliate in May 25, 1998

1997. ETRI, Institute's Korean Title changed

In Jan. 31, 1997, Institute renamed it as Electronics and Telecommunications Research Institute (ETRI) based on regulations for electronics and telecommunication

Mission

ETRI creates, develops, and distributes new knowledge and technology in the field of Information, Communications and Electronics. Also, it trains professional manpower ultimately enhance social and economical aspects of the modern society

Achievement

2010's

2011
· Developed Korean to English world-class portable automatic interpretation technology
· Developed transparency adjustable transparent display

2010
· Developed 4G LTE-Advanced Technology
· Developed Smart Ship Technology (SAN)

2000's

2009
· SMMD-Based 4D System Technology developed

2008
· ETRI developed world's first digital content vending machine

2007
· The world's first 3.6Gbps 4th Generation mobile communication technology (NoLA)

2006
· Developed Wireless Home Network (UWB)

2005
· ETRI succeeded in exported Embedded SW Solution
· Terrestrial DMB Service launched

2004
· ETRI develops WiBro Prototype

1990's

1999
· Developed Synchronized IMT 2000 (CDMA2000) STP System

1996
· Developed ATM Exchanging Machine

1995
· The world's first commercialization of CDMA

1991
· TDX-10 was launched
· TiCOM II was developed

1990
· 32bit microprocessor developed

1980's

1989
· Starting with development of 4M DRAM, Korea successfully developed 16M, 64M and 256M DRAM

1988
· 565Mbps Optical Communications System was successfully developed

1986
· TDX-1 Launched

1984
· ETRI succeeded in developing a 16bit UNIX computer

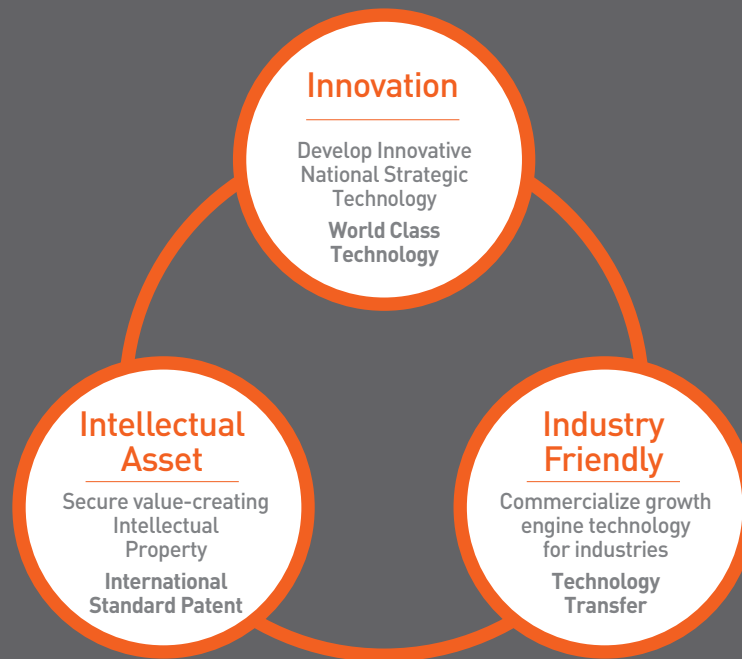**1983**
· Developed 8bit Educational Computer

1982
· The Nation's first semiconductor product "32K ROM chip" was successfully developed

Vision

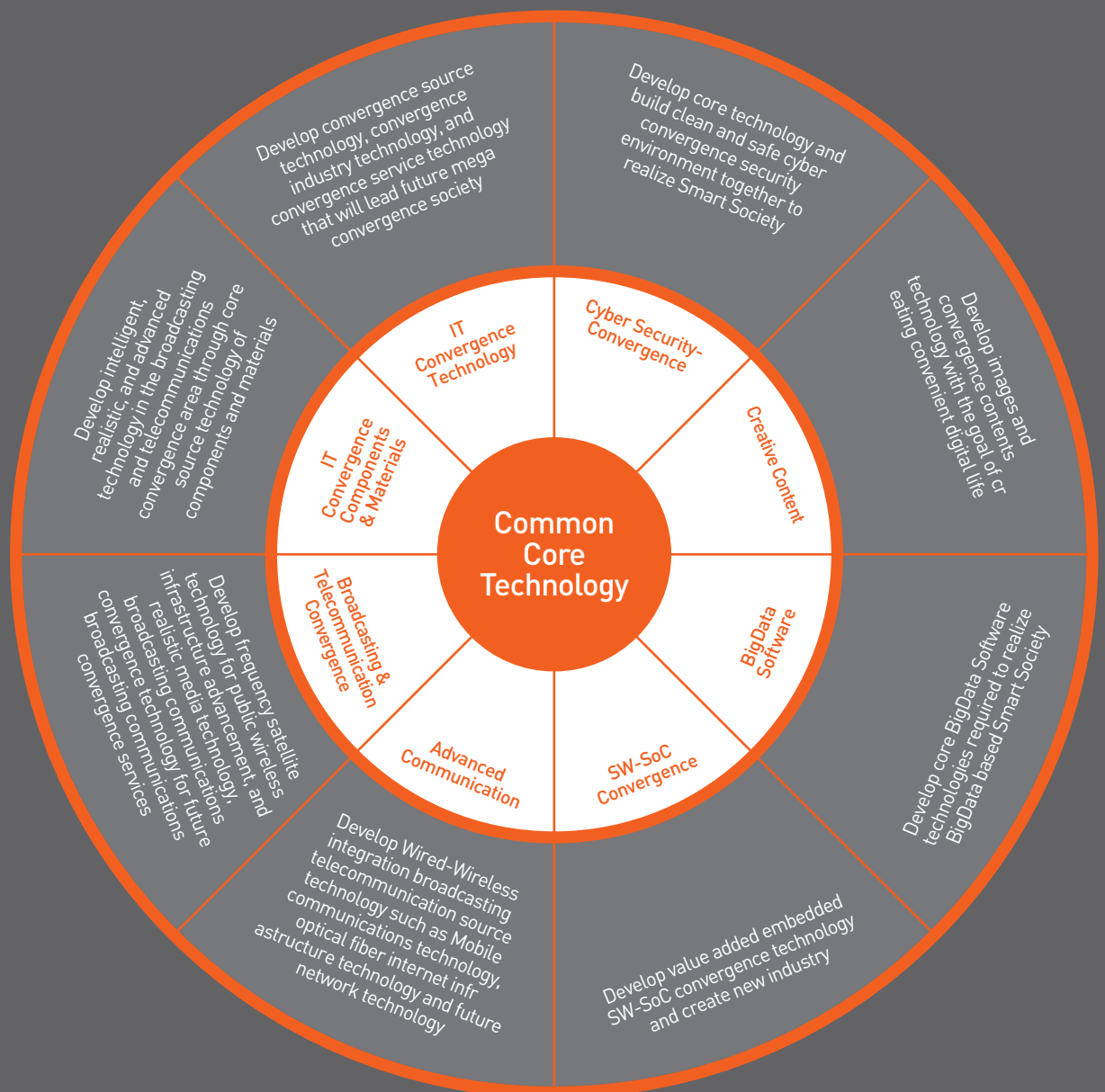● **Smart & Green Technology Innovator**

Management Principle

Innovation

Develop Innovative
National Strategic
Technology

**World Class
Technology**

**Intellectual
Asset**

Secure value-creating
Intellectual
Property

**International
Standard Patent**

**Industry
Friendly**

Commercialize growth
engine technology
for industries

**Technology
Transfer**

Strategy

● **Creative Management through continuous improvement and innovation**

| Creative Convergence Planning System | Global Open R&BD Platform | Intellectual Property New Biz Strategy | Technology Commercialization & New Eco-system | Creative Manpower |

Common Core Technology

● **Open Flexible and creative research planning system for
Mega Convergence Project**

Develop convergence source technology, convergence industry technology, and convergence service technology that will lead future mega convergence society

Develop core technology and build clean and safe cyber convergence security environment together to realize Smart Society

Develop intelligent, realistic, and advanced technology in the broadcasting and telecommunications convergence area through core source technology of components and materials

Develop images and convergence contents technology with the goal of creating convenient digital life

Develop frequency satellite technology for public wireless infrastructure advancement, and realistic media technology, broadcasting communications convergence technology for future broadcasting communications convergence services

Develop core BigData Software technologies required to realize BigData based Smart Society

Develop Wired-Wireless integration broadcasting telecommunication source technology such as Mobile communications technology, optical fiber internet infrastructure technology and future network technology

Develop value added embedded SW-SoC convergence technology and create new industry

IT Convergence Technology

Cyber Security-Convergence

IT Convergence Components & Materials

Creative Content

Broadcasting & Telecommunication Convergence

Common Core Technology

BigData Software

Advanced Communication

SW-SoC Convergence

Smart & Green technology innovator, ETRI

Linking the world with convergence technology,

ETRI provide new paradigm in IT Industry.

With world's best research ability and world's best technology,

ETRI is making Korea the leading IT Nation.

IT, changes the future of Korea, ETRI stands in the center of momentous change.

Research Fields

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IT Convergence Technology Research Laboratory

Convergence Components & Materials Research Laboratory

Broadcasting & Telecommunications Convergence Research Laboratory

Advanced Communications Research Laboratory

SW-SoC Convergence Research Laboratory

BigData Software Research Laboratory

Creative Content Research Laboratory

Cyber Security-Convergence Research Department

Creative & Challenging Research Division

Technology Strategy Research Division

Honam Research Center

Daegu-Gyeongbuk Research Center

Technology Commercialization Division

Research
Fields

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FUTURE IT CONVERGENCE CREATOR

The IT Convergence Technology Research Laboratory aims to develop IT convergence solutions to create new business, establish world-class industries, and promote the advancement of Social Overhead Capital.

To achieve its goal, the laboratory is developing a range of technologies, including environmentally friendly low-power computing technology for low-carbon green growth, u-health/life care technology for health and well-being, automobile/ship building and defense technologies converging sensors with telecommunications, intelligent mail distribution technology, the RFID and ubiquitous network technology that are the core technologies of the u-city of the future, and human-friendly and intelligent robotics technologies.

IT convergence Technology Research Laboratory

Vehicle & Defense-IT Convergence Research Department

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Vehicle & Defense IT convergence research department focuses on the development of advanced green/intelligent vehicle technology to support drivers, the development of digital maritime infrastructure/ communication e-navigation services, and the development of next IT-convergence defense information system and collaborate with leading academic, government and industry researchers to advance the state of the art.

To achieve above, we have been developing various core technologies such as 'Decision making/control technology of vehicle/driver cooperative autonomous driving system (Co-pilot) based on ICT', 'WAVE communication technology', 'Driver-oriented vehicle augmented reality system based on head up display for the driving safety and convenience', and 'autonomous vehicle guidance system and auto-valet parking system'. In the field of shipbuilding-IT convergence, we have been doing research mainly on 'The development of solution for ship safety navigation based maritime ad-hoc network' and leading standardization of the shipbuilding-IT technology. In addition, we have been developing IEEE802.15 WPAN wireless transmission technology for applying to various environments including home, office, shipbuilding, and vehicle and so on.

USN/IoT Convergence Research Department

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To make major traditional industries intelligent and to realize u-life, the research on USN/IoT is the one of core fields leading IT convergence. In the department, all the RFID technologies have been developed over its eco-system from chips, tags, antennas and readers to middleware platforms, mobile RFIDs, electronic shelves and RFID-based Real-Time Location Systems. Also, the USN researches focus on the essential technologies such as USN communications (RF, Modem, MAC and networking), sensor node SoCs, node middleware and IoT (Internet of Things) convergence with sential commune. IT convergence technologies are widely applied to real-life, making use of the core USN technologies, through developing applications of real-time asset tracking, surveillance, energy management, environmental monitoring, agricultural growth management, urban facilities management and so on.
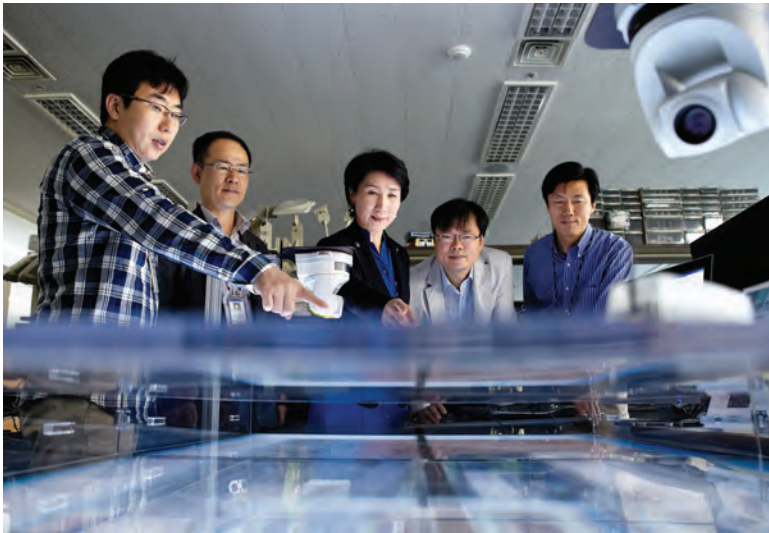
Robot/Cognitive System Research Department

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We aim to become a global technology leader in human-robot interaction, robot intelligence, and autonomous robot navigation through fusion of IT and RT. To achieve this, we have been concentrating on development of open platform for robotic services(OPRoS), context aware robot middleware, learning and developmental agent, vision recognition, multimodal based human-robot interaction, and vision SoC(System on a Chip) technologies.

In addition, we have been focusing on development of indoor/outdoor environmental awareness for autonomous robot navigation, position recognition and seamless positioning, 3D reconstruction based on space information, and u-GIS middleware technologies. With the results, we apply our knowledge to various robot developments such as personal service robot, military robot, silver-care robot, and surveillance and guard robot.

Green Computing Research Department

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The Green Computing Research Department is environmentally sustainable computing technology. The Green Computing Research Department tries to realize a smart green environment through the development of personalized effective and emotional service technology, smart convergence middleware and smart home services, smart grid technology, home/building energy management technology, and LED-based lighting communication technology. Keeping pace with the new national strategy 'Low Carbon, Green Growth', we are advancing in the field of green computing.

Bio health IT Convergence Research Department

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The Bio health IT Convergence Research Department is developing IT-BT convergence-based health and medical technologies to prepare for the aging society of the near future. The department is doing research on various IT-BT convergence technologies, including u-health, which is health management that is available anytime and anywhere; life care, which leads to a healthy life through the management of daily living; point-of-care, which makes on-site diagnostic; genetic analysis, which predicts genetic diseases; IT based new diagnostic and treatment systems, and components of medical devices. We are also actively conducting various activities, such as promoting new business initiatives and standardization.

Postal & Logistics Technology Research Department

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The Postal & Logistics Technology Research Department is dedicated to the research of green logistics and postal logistics technology for the national infrastructures of the postal service. The department has played a central role in the postal industry and has made numerous outstanding contributions, particularly in strengthening the competitiveness of the postal service through automation and digitization with the design of PostNet, and in developing address recognition technology for routing machines. We are working to develop smart postal technology in order to achieve sustainable postal operations and respond to the changes in the environment.

To achieve this goal, we are developing intelligent logistics planning, logistics processing digitization, address-based management systems, new service models and packaging classification technology. The department is also developing logistics convergence technologies for smart postal and logistics operations (e.g., the RFID System for Parcel and Courier Service, and the Logistics Network Knowledge Service).

**Research
Fields**

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THE GLOBAL LEADER OF SMART CONVERGENCE COMPONENTS & MATERIALS

The Convergence Components & Materials Research Laboratory is initiating the development of new technologies in the area of convergence components and materials, which is the core of the IT industry.

The laboratory is developing key, multi-functional, high-efficiency, and high value-added convergence components with linked systems and services through convergence system component technology that realizes convergence and integrated broadcasting systems, next generation semiconductor technology that will outperform current semiconductor memory, and green conversion components technology that will advance a low-carbon and green-growth agenda. It is also focused on creative and adventurous research projects that will overcome the limitations of current technologies and create the IT of the future.

Convergence Components & Materials Research Laboratory

Next Generation Display
Research Department

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The Next Generation Display Research Department is developing a core technology of materials, devices, and process for realizing next generation display such as flexible display, transparent display, electronic paper, OLED lighting, and LASA(Light Adaptable, Space Adaptable) display to embody time-to-market in display industry and to create new growth engines.

These developments include oxide TFT(oxide semiconductor, oxide thin-film transistor(oxide TFT), backplane based on oxide TFT and applied devices such as driving circuit for display, memory devices, and sensors based on oxide TFT), electronic paper(color electronic paper), OLED(white OLED panel, light extraction, and lighting system), and stretchable interface(materials, devices, and process for fabricating flexible and stretchable device, and stretchable module, structure, and circuit).
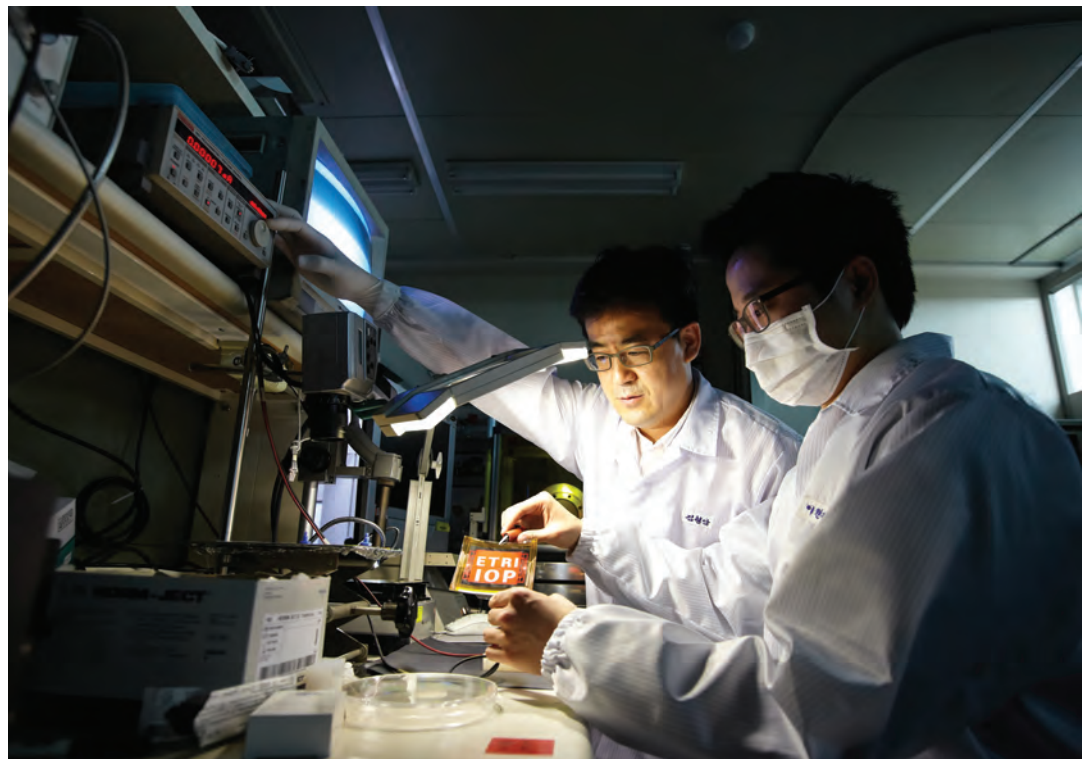
Photonic/Wireless Convergence Components Research Department

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As all activities of modern society become information-oriented, a need for high speed and large capacity mobile, satellite, fiber optic telecommunications systems is rapidly increasing. In this trend, the use of compound semiconductor based ultra-high frequency electronic and optical devices is inevitable in constructing an ubiquitous society.

The compound semiconductors such as InP, GaAs, SiGe,and GaN having inherently superior high speed electronic and optical properties to silicon, were used to develop the HEMT and HBT based MMIC (Microwave Monolithic Integrated Circuit) and its transceiver module with cost-effective small, lightweight and low power consumption for millimeter wave wireless communication systems. We are engaged in vigorous R&D on advanced photonics and RF-photonic technologies which bring new innovations and new possibilities to the Terabit optical communications field based on the photonic integrated circuit and millimeter-wave applications.

All R&D's are being conducted in a custom foundry level 3,600 sq. ft. clean-room laboratory dedicated solely for compound semiconductor device fabrication, which is fully loaded with many sophisticated equipment for processing, monitoring and characterizing up to 4-inch wafers. Laboratory equipment include i-line stepper, electron beam lithography, medium-current ion implanter, Plasma-Enhanced Chemical Vapor Deposition (PECVD), rapid thermal annealing, Molecular Beam Epitaxy (MBE), Metal Organic Chemical Vapor Deposition (MOCVD), flip-chip aligner/bonder and laser welder and so on.

The superior results obtained in the area of ultra-high frequency devices and opto-electronics are currently being transferred to the industry strengthening the competitiveness in the market. We are devoting ourselves to solidifying infrastructure for the world class cluster with leading edge military component technology. In the future, we will focus our resources on developing core devices with high performance and cost effectiveness for wireless and optical communication system.

NT Convergence Components
Research Department

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The NT Convergence Components Research Department carries out R&D on various NT-IT convergence technologies, such as MEMS-based and nano convergence sensors, self-charging power systems integrating energy conversion, storage and management devices, and BLDC motor driving circuits based on high-voltage high-current power devices. We are also focusing on research into high-performance mixed-signal products and intelligent sensor signal processing algorithms for image recognition and SoC technology. In addition, we are working on the development of NT convergence technology incorporating IT and ET, including a silicon photonics technology for future computers, in order to improve our industrial competitiveness in IT, NT, and ET and create new markets.

Green Devices and Materials
Research Department

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Advanced Solar Technology Research department is developing and commercializing the solar cell technology to convert the infinite and clean solar energy to electricity in order to solve the global energy problem due to the fossil fuel depletion and the global warming due to the environmental pollution.

We are developing Terahertz wave technology, as future frequency resources. Terahertz waves are in the region of the electromagnetic spectrum between 300GHz to 10THz, corresponding to the wavelength range from submillimeter of electronic devices to 30 micrometer of photonic devices. These waves travel straight in the line of sight and penetrate wide variety of non-conducting materials, which make them applicable to the future sensor and ultra-broadband communication.
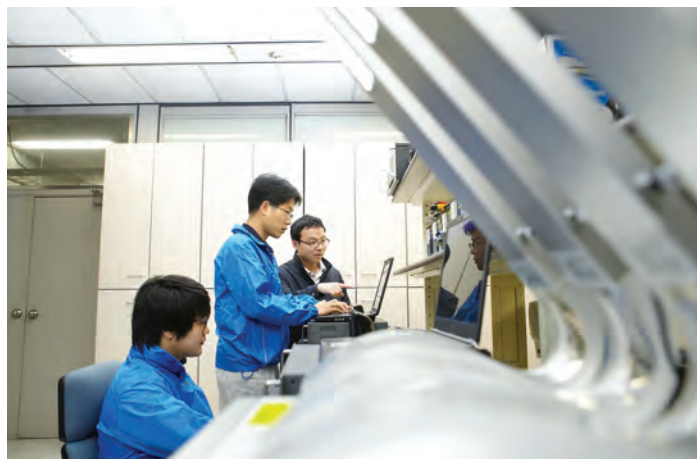
Research
Fields

THE IRRESISTIBLE WAVE OF THE FUTURE & THE WORLD BEST COMPETITIVENESS

The Broadcasting & Telecommunications Convergence Research Laboratory has been conducting researches under the vision of "Leading the New Technologies in Broadcasting and Telecommunications Convergence(BTC) for Greater Korea". The key objectives of our researches are to develop next generation BTC core technologies and international standards, to create high class global BTC service with realistic BTC technologies, and to improve facilitation of RF resource service with advancement and enhancement of RF resource application.

Broadcasting & Telecommunications Convergence Research Laboratory

Next Generation Smart TV Research Department

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The Next Generation Smart TV Research Department is developing the beyond smart TV(Smart TV 2.0) technology based on CPNT which supports those services such as the broadcasting, telecommunication, a convergence of broadcasting & communication, and computer service through multi-screen.
The main research areas include HTML5 based smart TV software platform technology, augmented broadcasting and broadcasting advertisement technology, multi-modal user interface & experience technology based on speech recognition and gesture recognition, media transmission technology, multi-screen service technology, intelligent media search & recommendation service technology for smart TV 2.0. We are implementing test-bed and smart set-top-box for technology verification.

Broadcasting Systems Research Department

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The research objectives of Broadcasting Systems Research Department are enhancement of the digital broadcasting systems/services and fundamental research, standardization, and systems/services development for promising future broadcasting technologies. The target technologies are inclusive of the next generation digital cable transmission system, terrestrial digital TV enhancement, terrestrial DTV emergency broadcasting system, AT-DMB for channel expansion and quality enhancement, smart hybrid T-DMB for broadcasting/broadband convergence service, automatic cognition T-DMB emergency broadcasting service, 3DTV broadcasting, and digital holographic system.

Broadcasting & Telecommunications Convergence Media Research Department

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Broadcasting & Telecommunications Convergence Media Research Department is dedicated to human-friendly, realistic, interactive media technology for human happiness. Our main research areas are multimedia signal processing for realistic /human interactive media service, and realistic broadcasting services including three-dimensional television(3DTV), ultra-high definition television(UHDTV), and holographic TV. The current projects are focused on the development of core technologies for multiview 3D compatible UHDTV broadcasting system, stereoscopic 3DTV broadcasting system, interactive view control technology for IPTV, HCI-based UHD panorama service platform, non-wearable gaze tracking system, emotional UI/UX based broadcasting system, ST CinePro cinema processor, and Holographic 3D video system. In addition, we have actively participated in the development of international standardization with our technologies.

Satellite & Wireless Convergence Research Department

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The Satellite & Wireless Convergence Research Department is developing the state-of-art technology for the satellite communication/broadcasting and its application based on the space proven activity and commercialization of COMS satellite launched in June 2010 with in-house developed Ka-band payload and performance verification of its TT&C system. To support these goals, we are developing core technology for DVB-RCS NG-based high-efficiency satellite VSAT transmission, a realistic satellite broadcasting service that offers guaranteed continuity of broadcasting services amid changes of channels including heavy rainfall, Global Navigation Satellite System and its application technologies, as well as IMT-Advanced satellite and terrestrial integrated network connection for next generation satellite mobile communications. In addition to these, we are also developing RF equipment including MMICs for radar/antenna/transponder for the next generation satellite radio convergence services based on the heritage of COMS project, analyzing the impact of radio waves in space, and researching on the meteorological data reception and processing technology.

Radio Technology Research Department

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The Radio Technology Research Department is developing spectrum utilization and spectrum sharing techniques, core and system technologies for new radio resources, applied radio technologies, and electromagnetic environment technologies. Spectrum utilization and spectrum sharing technologies are being developed using advanced spectrum engineering, and improve the spectral efficiency of limited radio resources through approaches such as cognitive radio. The development of new radio resources is focused on new system design and radio transmission approaches that are suitable for the radio environments such as millimeter-wave and Tera Hertz band, in order to achieve data rates of several Gbps. Research on Electromagnetic (EM) engineering technologies include countermeasures to the adverse effects of EM wave on the human body and interference between devices, EM computational analysis, the measurement of unused EM waves, and the monitoring of EM emissions. For industrial radio applications, we are developing applications such as breast cancer screening and food safety technologies by using spectroscopy and imaging technologies in the millimeter wave and Tera-Hertz bands.

Smart Screen Convergence Research Department

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Smart Screen Convergence Research Department is performing research and development on core technologies for providing more convenient and useful service using a variety of smart device with the aims of user-centered participation and common-ownership, personalization and service convergence. Especially, we are responding very well to the future convergence service environmental changes utilizing a lots of core essential technology that has been developed by us and developing the core essential technologies to realize the various smart screen service technologies including next generation Smart TV service.

Main research topics that we are today carrying forward are enabler technologies for social TV services, collaboration services technologies between screens using dynamic relocation techniques of web contents. We are also pushing forward with core technologies such as tele-screen system technologies which is next generation digital signage system based on context-awareness, Web mobile virtualization platform technologies based on HTML5, and cloud-based media virtualization technology.
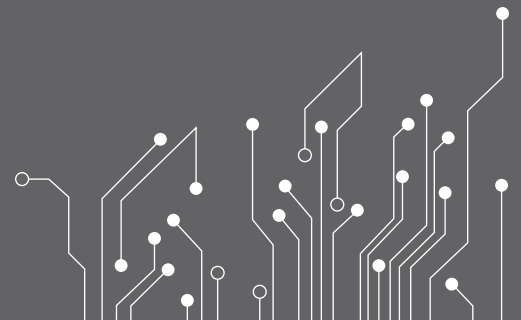
Research
Fields

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LEADING THE WORLD WITH NEXT GENERATION TELECOMMUNICATION TECHNOLOGY
The Advanced Communications Research Laboratory is actively researching on the fields of next generation mobile communication technology and future network technology to secure source technology and standardized technology. Through these researches, the quality of life and public convenience would improve through the realization of mobile life and communication services that can be provided anytime, anywhere. Also it would bring the future knowledge-based society into reality. We would like to further develop the current IT technology and also contribute in a way of creating a new industry by converging with various industrial fields.

Advanced Communications Research Laboratory

Future Internet Technology Research Department

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The Internet which was created in 1974 as communication means for researchers has been grown enormously toward a global network infrastructure that affects every aspects of our daily lives. But, due to radical changes in communications environment and emergence of new users' requirements have pushed to ponder over the limitations of the current Internet architecture and their associated fundamental problems. Along the line of such recognition, clean-slate architectural research on Future Internet has actively been conducted by various research groups globally. Future Internet may mean a new Internet which will be designed in clean-slate manner to overcome the current Internet's architectural limitations and to accommodate newly emerging future requirements.

Our Future Internet Research Division is conducting various researches in the area of Future Internet to respond to the global research trend. Using architectural studies as our corner stone, we are actively engaged in the research of Future Internet services, applications, platforms, test-beds, experimentations, and federation of various test-beds domestically and internationally.

Advanced Mobile Communications Technology Research Department

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Advanced Mobile communications Technology aims to provide a high-quality, high efficient future mobile service including time-spatial fluctuations acceptance and are nearly 10 times more radio transmission capacity and energy efficiency than 4G system, both on the spot and on the move.

Advanced Mobile communications technologies include technology enabling efficient convergence and combined services based on the mobile multimedia internet driven by smart phones and smart pad as well as high-speed broadband transmission technology.

We are researching and developing LTE based B4G mobile communications and related technologies(multi-mode (Multi-RAT) multi-cell(Multi-tier) integrated baseband access technology and maritime digital radio technology for e-Navigation technology, etc.) for smart mobile services.

We are promoting the global standardization of the key technology IPR by contributing technologies currently under development to international standardization organizations such as ITU-R and 3GPP.

Mobile Convergence Research Department

To address a rapid increase in mobile internet service due to high penetration of smart phones, we focus on the commercial development of a 4G wireless communications system, research on the post-4G technology, and an endeavoring to apply technically proven wireless communications systems to other industries (national defense, public security, railroad, university network, etc.).

The Mobile Convergence Research Department is currently developing a commercial WiBro-Advanced system and ultra-precise localization technology. We are also developing novel technologies for post IMT-Advanced technology and are standardizing IEEE 802.16. For wireless communications application system research, we are developing WiBro-based public security and disaster rescue communications system, a railroad wireless communications system, and mobile tactical mesh technology.

Wireless Telecommunications Research Department

5G mobile communication is the future mobile technology which has 1000x larger wireless transmission capacity than the present mobile communication (4G). The main goal of 5G mobile communication is to realize knowledge-enriched communication network, which not only has similar characteristic to human nerve system but also provides more advanced communication than the simple voice/data transmission.

Our perspectives for 5G communication system is not only to follow the aspects of 3G and 4G mobile communication development process but also develop revolutionary mobile communication system.

Wireless Telecommunication Research Department carries out the developments and researches for the 5G related technologies such as Center-Autonomy Network Technology, mmWave and related RF technology, and Post Wi-Fi. Through the results of these developments and researches, We make lots of contributions to international/domestic organization for standardization and play a lead role in 5G mobile communication standardization.

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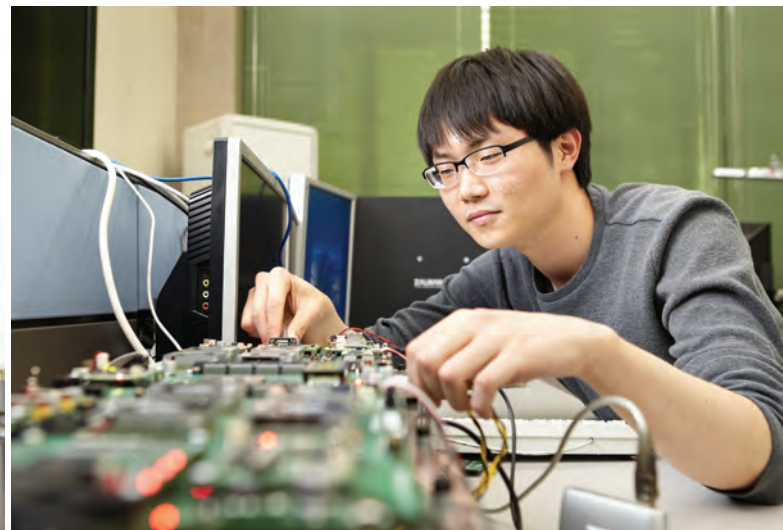
Computing Network Research Department

Computing Network Research group seeks for multi-dimensional solution for resolving problems of IT infrastructure. The typical problems include limitations of value creation when we use the legacy network infra that was originally designed for simple delivery of Internet traffic, limitations of flexibility in information distribution, limitations of reuse of network resource, and limitations of security as a social infrastructure.

To resolve these limitations, we focus our research effort on smart cloud networking technology where the network, computing, and storage resource are tightly coupled. We anticipate this will be the core technology to realize an efficient exchange of knowledge and information in BigData era when the cloud computing services and variety of new media services are commonly used.

In detail, we perform researches on source technologies for industry such as wired-wireless convergence service access networking technology, embedded computing based smart node platform technology, open switching and networking OS technology, open media exchange technology. We also try to spread out virtual private cloud networking technology, clean Internet control technology, DDoS-aware smart router technology to fulfill upcoming public demands such as increasing synergy between industries, vitalizing smart work and cloud services, and building the IT cyber security system.

Optical Internet Research Department

An increase of telecommunication traffic being triggered by Internet is 40% per year and is expected to continue afterwards resulting in 10-folds traffics. The Optical Internet Department conducts the research on technologies that enable the network of 10Tb/s, 100Tb/s and 1Pb/s step by step. Future networks can be realized only through innovations that we never have experienced.

We focus our effort to achieve technical breakthroughs on the issues such as the evolution of the access network in the architecture and the functionality that has been started by deploying FTTH, end-to-end packet transport services typified by the Carrier Ethernet service, optical-circuit-packet integrated transport network that maximizes the advantages each of optic, circuit and packet transport network. Intelligence and automation of management and control for integrated multi-layer transport network to revolutionize the improvement reliability and the conveniency in operation of the whole transport network.

Also, we research on dynamic configuration of data path to meet the dynamic transport-service demand. Optical signal modulation and the related signal processing components to realize the high-speed transmission of 100Gb/s or more . The optical switch and the new transport/routing protocol that enables the packet switching or routing with the throughput higher than 10Tb/s with low power consumption. SDN that splits packet forwarding plane and control plan by an open standard interface called Open Flow makes central network management possible, which allows for users to access and utilize network resources easily and effectively.
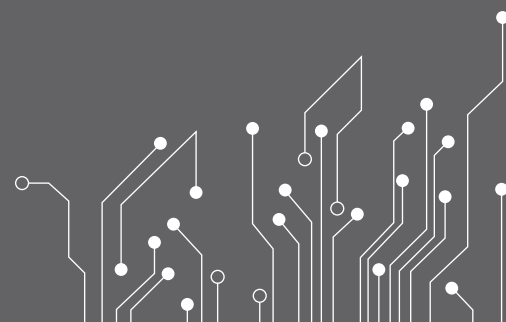
Research
Fields

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SW-SoC CONVERGENCE TECHNOLOGY INNOVATOR
The SW-SoC Convergence Research Laboratory(SSCRL) is an open R&BD convergence laboratory, which will provide Korea with competitive advantage over other countries through converging technologies of System SOC and Embedded Software, supporting and incubating business, cultivating professional manpower.
SSCRL will strengthen core competitiveness of SW-SoC convergence industry through maintaining superiority of IT industry competitiveness and prior occupation of new convergence industry based on open convergence platform.

SW-SoC
Convergence
Research Laboratory

Embedded Software Research Department

●

Embedded Software Research Department has developed the open software platform, and has been endeavoring to enhance national competitiveness of the next generation software through creating added value of IT and manufacture industries by providing the software platform. To this end, the department provides a software platform as an integrated form of operating systems, middlewares, and development tools. The software platform has been provided to various fields including military, avionics, energy, automotive, mobile and smart appliances. Technologies of the software platform focus on fields required in corporate and individual users "every time, everywhere" so that industries can take advantage of offers. In addition, on-off line services getting near customers are in progress to adopt these developed solutions easily. In particular, the department has been preparing for convergence between a variety of industries and services by developing the core enabling technologies of D2D smart connection, AV group communication and CPS on the basis of Linux & RTOS and a sensor OS.

System SoC Research Department

●

System-on-Chip Research Department now works on SoC developments to secure the national competitiveness, especially, on the four primary topic which are mobile, smart appliances, energy, and automobile. For achieving our goal, we are making researches on the high performance embedded processor which is the foundation of IT industries, the ultra high definition video codec and graphic processor for the next generation multimedia services, the advanced T-DMB SoC and LTE femtocell SoC for answering the convergence of broadcast and communications, the smart human-interface SoC and its applications, and the digital RF SoC for maximizing the connectivity between smart devices. Moreover, we are trying to contribute to the development of national industries through the development of the green SoC for improving the power-generation efficiency of the new regeneration energy system, the fault-tolerant processor for automobile electric system, the 77GHz automobile radar system based on CMOS SoC, and so on.

Seoul SW-SoC R&BD Center

●

A system semiconductor integrates various functions of a system into a small chip by combining the hardware and software. The system semiconductor has been spotlighted as a significant potential new growth engine for the nation, through application to different industries, such as automobiles, BIO and Green semiconductors, Smartphones, and DTVs. SW-SoC Convergence Center has been working to promote the system semiconductor industry by training high-quality design human resources in IT convergence through education programs for graduate students and company employees based on industry demand. SW-SoC Convergence Center is also trying to strengthen the competitiveness of small domestic system semiconductor businesses by supporting SoC total solutions (design environment, financial support, opening business and marketing of SoC etc) for system semiconductor development on the basis of specialized system SoC development platforms.
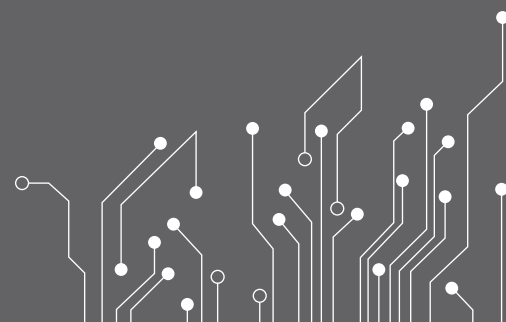
Research
Fields

●

VALUE CREATING SOFTWARE TECHNOLOGY, CHANGES THE WORLD
At the BigData Software Research Laboratory, we are conducting research on the BigData SW
technologies required to help Korea develop into smart convergence ecosystem while boost-
ing national competitiveness.
Specifically, we are developing speech/language information technologies and big social data
analysis technology for a smart IT environment. We are also pursuing smart convergence in
various industries based on BigData software platform, and developing BigData infra tech-
nologies such as cloud computing and supercomputing technologies. For future disruptive
computing technologies, we are developing UI/UX and other creative computing technologies
that maximize human emotion and convenience.

BigData Software
Research Laboratory

Automatic Speech Translation and Knowledge Analytics Research Center

●

The Automatic Speech Translation and Knowledge Analytics Research Center aims to realize a 'convenient community in a human-friendly computing environment for the 21st century' knowledge-centered society by achieving remarkable developments in speech, language, and knowledge processing technologies. We are conducting research on an multilingual machine translation technology that will eliminate the language barriers in global business environments, interactive speech interface technologies with a large vocabulary for various devices in the ubiquitous society, social web issue detection and monitoring technologies, and an automatic speech translation system for travelers. We are also developing computer aided English learning system with a dialogue based speech recognition interface technology.

Cloud Computing Research Department

●

The Cloud computing is the computing technology providing virtualized IT resources based on Internet technology, and it will be used as needed to borrow the IT resources such as SW, servers, storage, and network. And it also supports real-time scalable service depending on the load, and provides the computing methods used to pay as much as. The Cloud Computing Research Group develops next generation cloud computing core technologies proving new concepts. It accelerates the creation of high quality and new knowledge information services so that it keeps us the strong internet country. It also performs the acquisition of the highest fundamental computer technologies in order to be the best IT country.
We are now mainly performing the R&Ds in the following areas:
  - Development of Cloud DaaS (Desktop as a Service) System and Terminal Technology
  - Cost-effective, high-performance cloud storage SW (GLORY-FS)
  - A Study of 3D SW Service Method using Client Rendering
  - A Study of Virtualization Technology
  - Development of Supercomputing System specialized for Genome Data Analysis
  - A Study of Stream Processing and In Memory Database Technology
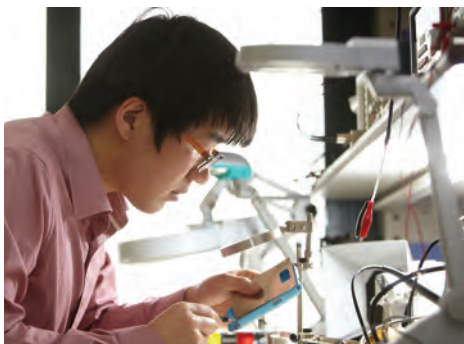
Next Generation Computing Research Department

●

Computing technologies in a knowledge-based society are being evolved to provide human-friendly computing services with better user experience. They are being developed to the technology of creative computing that can be used anytime and anywhere by overcoming constraints of the performance, service boundaries, and shape of devices. Next Generation Computing Research Department is aiming to develop technologies and systems for personal computing, social computing, wearable computing and smart human-computer interaction for moving up future human-friendly and creative computing environment. Current research projects include personal stream type data analysis and real-world knowledge digest, human-friendly personal computing platform, social big data analytic platform, skin patch type computing platform, and smart UI/UX platform including touch, haptic and contact-free gesture interface.

Research
Fields

●

2012 ETRI TECHNOLOGY REPORT

PEOPLE-CENTERED, PEOPLE-FRIENDLY DIGITAL LIFE

The Creative Content Research Laboratory develops video content and convergence related technologies with the goal of creating and improving a people-centered digital life.

In pursuing this goal, the Creative Content Research Laboratory has focused aggressively on research and development in the following areas of technology: computer graphics, computer vision, high-quality video and gaming content production, virtual reality technology, copyright protection management technology, u-learning technology, and digital cinema and signage technology. Above all, our emphasis on core technology and content creation for new markets has led to innovations in 3D stereoscopic video, smart content and experience-enabled content. The Creative Content Research Laboratory strives to actively contribute to the growth of the content production industry by developing the cutting edge tools and technologies required by the global media marketplace.

Creative Content Research Laboratory

Visual Content
Research Department

●

The Visual Content Research Department has been conducting research on a broad range of high-quality 2D and 3D imaging and game-related technologies. More specifically, we are focused on computer graphics, computer vision, fluid simulation, full 3D reconstruction, 3D image synthesis and visualization, real-time rendering, image mixing, high-quality game production, and server technologies. To create a new market, we have been concentrating on the development of 3D imaging, experience-enabled content, smart content and new digital media technologies.

Convergent Content
Research Department

●

The Convergent Content Research Department research area include mixed reality and simulation technology for development of virtual reality, copyright content filtering for DRM interoperability environment, content protecting area for developing forensic marking technology. Interactive learning technologies for u-learning and mastering and codec technologies for digital cinema are also being developed. We will develop the technology for Live 4D, e-training, copyright in the cloud environment, 8K digital cinema and signage, development and testbed establishment of N-screen content.
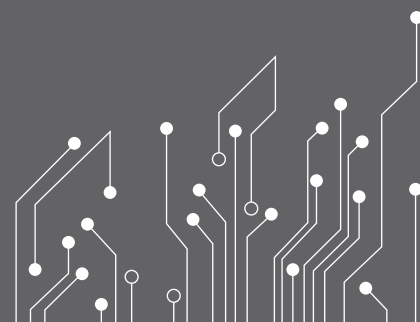
Research
Fields

●

REALIZATION OF SAFE AND SECURE ENVIRONMENT FOR SMART SOCIETY

Cyber Security-Convergence Research Department aims to develop clean and safe cyber convergence security environment together with the core technical development. To achieve its goal, the laboratory is developing security production and service based on the three R&D fields such as IT Information Security, Physical Security, IT Convergence Security. Especially, as a stronghold for R&BD of national cyber security convergence, it secures core technology and connects technological competence of industry, academia, research institutes and government. Also, it focuses on securing capability of real-time response to threat by 99.99% in year 2015 and expanding Cyber Security Convergence Industry by 50%.

Cyber Security-Convergence Research Department

Cyber Security-Convergence Research Department

Cyber Security-Convergence Research is largely divided into three fields. First, the information security R&D based on the network and system in the automatic Internet radar for the national correspondence to the new threat and the mobile/UNIX security technology for the industrial competition enhancement. Second, the physical security R&D in the personal safety system and the smart CCTV security technology for being secure from the danger. Third, the convergence security R&D in the industrial facility security, M2M security and the convergence among the traditional industries. On the other hands, Cyber Security-Convergence Research is focused on the core technology R&D in the information security for the homomorphic cryptography, high performance network trace and in the physical security for the intelligent video recognition, soft-biometrics.

Research
Fields

●

CREATION OF NEW CONCEPTS

The mission of the Creative & Challenging Research Division (CCRD) is to develop a medium-long-term research strategy as well as technical planning for future technologies, to conduct pilot research projects, and to coordinate research projects in the IT convergence, SW content, Convergence Components & SW-SoC, broadcasting and telecommunications convergence, and Future Communications Technology areas.

The Creative & Challenging Research Division strives to perform world-class research in fundamental research areas, to identify large global brand technology fusion projects, and to conduct open R&D through joint international cooperation between academia and industry. The Creative & Challenging Research Division is also initiating five new research groups, called creative research teams, to establish new conceptual ideas and to secure world class technologies.

Creative & Challenging Research Division
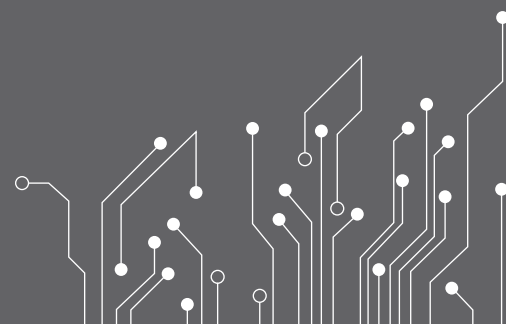
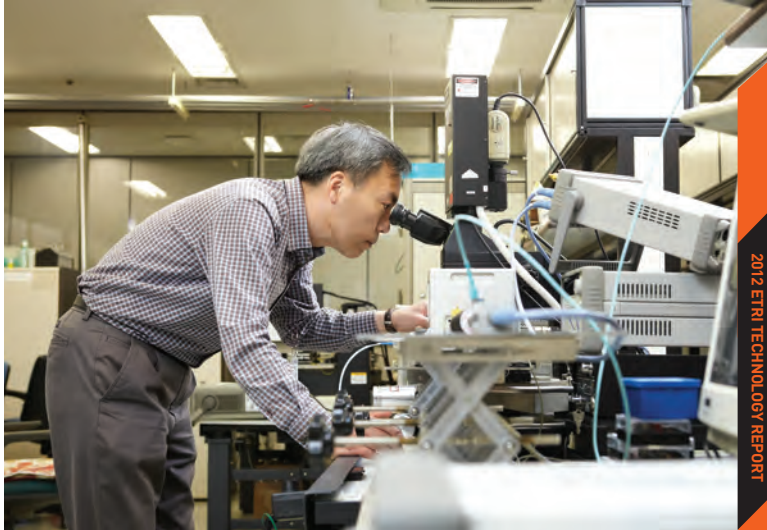## IT Convergence Services Future Technology Research Department

●

The IT Convergence Services Future Technology Research Department establishes the medium-to-long-term research and development plans for the IT Convergence Technology Research Laboratory, plans new projects in the IT convergence technology field, performs overall coordination, researches future technologies in the IT convergence technology field, conducts leading research into core IT convergence technologies, and researches future convergence technologies and source technologies for the creation of new industries. We aim to plan some mega projects, perform leading source research, and establish some creative research laboratories related to IT.

SW & Contents Future Technology Research Department

●

The SW & Contents Future Technology Research Department plans and develops future core technologies in the area of Software, Contents and Information Securities.
It thus establishes the developmental direction of future technologies in those areas, propose the Korean growth model of the knowledge-based service industries, and develops the fleet-type R&D framework that embodies the common objective of software, contents as well as the information security areas.

Convergence Components & SW-SoC Future Technology Research Department

●

The mission of the Convergence Components & SW-SoC Future Technology Research Department is to establish the R&D planning of convergence components & SW-SoC convergence technology and to pre-study the core technologies to respond to the changes in R&D environments, such as the demand for convergence and energy saving. It is also establishing an R&D vision, planning for standardization in the field of components, materials, and SW-SoC convergence technologies, and performing the overall coordination of the R&D activities.

Broadcasting & Telecommunications Convergence Future Technology Research Department

●

The Broadcasting & Telecommunications Convergence Future Technology Research Department focuses on acquiring concept-based patents through core technology research, work that is related to the innovation technology plan research in the field of realistic media technology, convergence technology for broadcasting and telecommunication, radio wave technology, and satellite technology in the converged broadcasting and telecommunications environment. This department is also focused on creating new growth engines through the generation of mega projects, an original idea convergence research project based on new concept creation through broadcasting and telecommunications
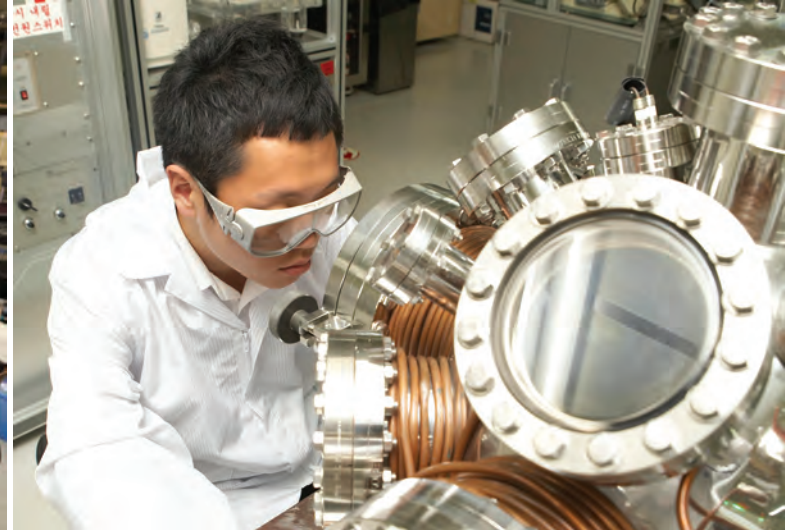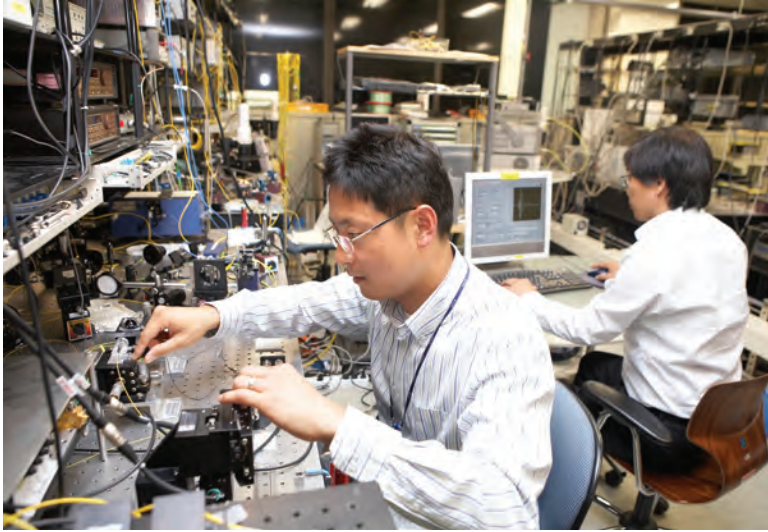
Future Communications Technology Research Department

●

Future Communications Technology has the potential to create and pioneer the next mobile communications and converged infrastructure technology, including future Internet, in order to cope with a variety of user demands, rapid technological development, and sudden changes in the R&D environment. We are exploring and planning new innovative mega-projects to handle future communications technology. In addition, we are focusing on the planning of R&D strategy and the overall coordination of ongoing projects in the future communications area, and are leading research on future mobile communications and the Internet with u-infra technology.

Graphene Electronics Creative Research Section

●

This department is developing various electronic and optoelectronic devices using graphene, a key next-generation material. To carry out research on graphene electronic and optoelectronic devices, it is critical to be able to manufacture massive volumes of high quality grapheme, and to secure the technology that enables the control of its properties. This department is developing high-quality wide graphene growth technology through chemical synthesis and the CVD growth method, memory, sensors, LED, ultra high-speed transistors, plasmonic optoelectronics and metamaterials.

THz Photonics Creative Research Center

●

Recently, there have been active studies on the application of THz to information and communications technology, security, biology, medicine, non-invasive testing, food and agricultural goods quality control, and environment monitoring. To exploit THz radiation in everyday life, small and cost-effective THz components and systems must be developed.

Photonics technology is a well-matured technology. If we adopt photonics technologies, we can made the most use of the optical components, electronics components, measurement instruments, and measurement techniques developed for the photonics industries. We are developing THz components such as dual-mode laser diodes and wide-band/high-power photomixers, and THz systems such as THz spectrometers and tunable THz transceivers based on photonics technology to realize portable THz systems.

MIT Creative Research Section

●

The Metal-Insulator Transition (MIT) Research Department is focused on MIT, the unsolved riddle of solid state physics, and is researching applied MIT technologies. Mott MIT, which is free from structural transition, is based on the hole-driven MIT theory developed by ETRI. The department is researching the mechanism with diverse strongly correlated materials, using THz spectroscopy, infrared ray and ultraviolet ray based spectroscopy, Raman scattering, I-V analysis, X-ray and meta materials. For applied MIT Information Technology development, the department is researching MIT materials, MIT devices, MIT highly sensitive sensors, MIT-based applied systems, MIT LED and MIT meta materials. Those MIT critical-temperature-based switch devices which have already been developed and are being commercialized will be applied to fire alarms and power transistor cooling.
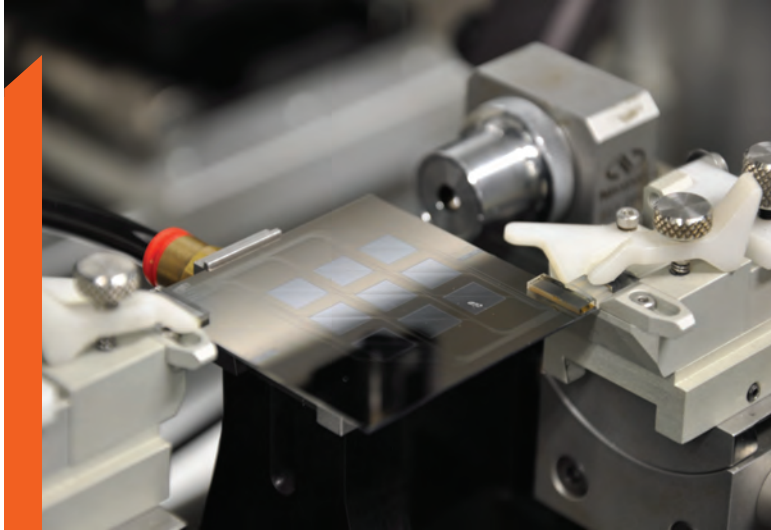
Transparent Transducer & UX Creative Research Section

●

In these days, the value of user interface is getting more important than the value of technology itself. It is obvious that future electronic devices will require new user interface, and the Transparent Transducer & UX Creative Research Center is studying innovative interfaces for user experience, convenience and intuition. Particularly, future display such as flexible/transparent display will need new interface composed of flexible/transparent components, and the major research area of our lab is developing transparent actuators & sensors, and interaction methodology.

Nano Electron-Source Creative Research Section

●

Nano eletron-source creative research section is focused on studying ultra-high density field emission electron-sources based on nano-scaled materials, for example, carbon nanotube, graphene and nano wires. Especially, we are developing a core technology of quantum-degenerate limit electron sources to overcome the technical limitation of conventional thermionic and cold cathode ones, and applying them to new-concept devices such as a miniature digital X-ray source, smart X-ray computed tomography system, high-power terahertz source.


2012 ETRI TECHNOLOGY REPORT

Research
Fields

●

SMART WORLD NAVIGATOR
The Technology Strategy Research Division has been playing a leading role in transforming IT technologies to increase national wealth by forecasting promising future technologies, analyzing feasibility of core IT R&D, and developing technical standards. Also, it has been the liaison between the technologies-market-policies-technology standards and generated the optimum synergy effects to develop the successful strategy in developing and utilizing Information Technologies.

Technology
Strategy
Research Division
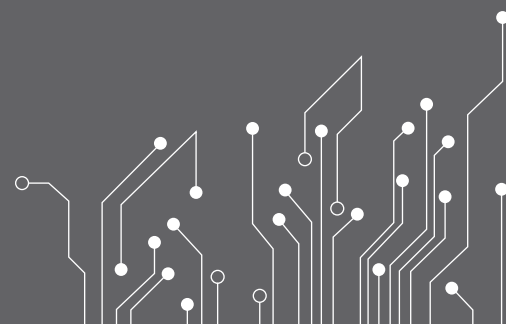
Techno-Economics Research Department

●

It aims to play a pivotal role for successful R&D at ETRI, which eventually will strengthen competitiveness of Korean IT industry. We have absolute advantage on research capabilities, which encompass planning R&D and developing policy for IT industry, through linking analysis of the IT industry ecosystem, analysis of the tech-economic feasibility of core IT R&D, promoting IT policy and the evolution of regulation, and conceiving a global expansion strategy. Also, in 2012 it will carry out analysis on strategic industries such as UHDTV, IPTV, Smart-TV, Displays, B4G, Cloud Computing, Auto-IT Convergence Technology and industrial ecosystems on new emerging technology, tech-economic feasibility analysis on key IT R&D and study on telecommunication industrial systems and global business strategies.

IT Services Policy Research Department

●

It aims to transform the IT, which is highly demanded by the country, society and industry, into national wealth. To accomplish the goal, it has predicted and analyzed the future marketability of ICT. Also, it carries out researches to establish regulations, alternative policies and business models on Broadcasting-Communication industry.

Standard Research Department

●

SRC (Standard Research Center) is an ETRI's sub-organization specialized for standardization in ICT area. It directs and collaborates with other divisions to develop international standards for future technologies, establish standards for public services and promote international standardization of ETRI's R&D outcomes.

The main areas it has involved include IPTV/Smart TV, smart work, contents networking, overlay service networking, P2P, IPv6, RFID/USN, M2M/IoT, Green ICT, Future Network, Mobile Web, Next Generation web, Cloud Computing, Mobile Telecommunications, Smart Grid, and etc. Also, the SRC focuses on the development of regulations and standards on ICT area to serve the public, e.g. Emergency Communication, Voice Phishing, Lawful Interception, and Number Portability in cooperation with government.
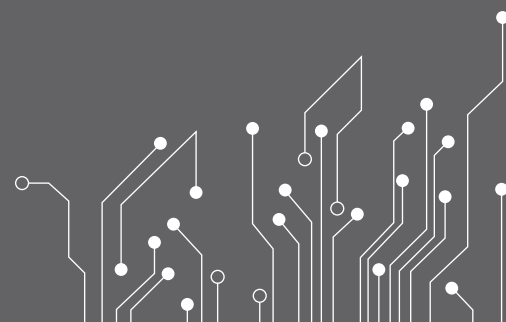
Research
Fields

●

WORLD CLASS COMMUNICATION TECHNOLOGY

The Honam Research Center has gone to great lengths to develop into a technical hub for the promotion of the leading and strategic industries of the Honam region through R&BD of IT convergence technology. To this end, the center is supporting technology from strategic businesses in the area and developing customized technology for the facilitation of local businesses, while commercializing the technologies developed by the main office and the center for distribution. In addition, the center has supported over 200 cases of A2LA tests in relation to optical communications components and operated the 'one company, one researcher' mentoring program to solve the difficulties faced by industries and facilitate local businesses in the region.

Honam
Reserch Center

Customized R&D for regional strategic industries

●

HRC performs a project for customized joint-research with local companies for commercializing ETRI's core technologies based on requirements from the companies. Additionally, HRC has fostered regional strategic industries by counseling and advising on technical bottleneck, by international certification tests in optical communications within the project.

Energy efficient optical access network based on XG-PON technology

●

As a low-power access network technology for urban infrastructure of GreenIT City, XG-PON core technologies has been developed to realize Giga-class wire and wireless services. XG-PON technology, based on ITU-T G.987 standards, replaces xDSL, LAN, HFC and EPON/GPON technologies in an existing access network, and enables Giga-Internet services to each subscriber. HRC leads development of XG-PON MAC and system technologies to strengthen the technical competitiveness of the domestic companies and to foster optical communications industry.

Green IT Urban Control & Surveillance Technology

●

In order to achieve efficient urban control & surveillance, HRC has developed core technologies such as sensor data transfer technology based on wireless network and DTN, sensor data analysis technology based on real-time pattern classification, and high-performance computing based mobile gateway. HRC plans to apply network protocols, embedded software and hardware modules from this project in a regional field trial service along with a telecom company for deployment and commercialization of the technology.

International Certification Tests in Optical Communication

●

HRC is the only laboratory in Korea that is accredited by A2LA for testing optical communication elements, components, modules, devices and systems. The testing services includes 15 reliability test items for temperature/humidity cycling, mechanical shock, vibration, internal moisture test, etc., and 40 performance test items for center wavelength, return/insertion loss, PMD, etc., according to 66 international standards such as Telcordia, IEEE, IEC, TIA/EIA, MIL-STD etc.

**Research
Fields**

R&D MECCA OF IT CONVERGENCE

Daegu-Gyeongbuk Research Center, established to create added value, strengthen technology competitiveness and regional IT industry, aims to reinvigorate regional industries by commercializing the source technology of ETRI, lead the regional R&D through securing core technology of IT and grow as regional R&D center for incubating innovative SMEs.

We will continue research and develop greenhouse technology, next generation intelligent software platforms for vehicles, and technologies that guarantee reliability for the advancement of regional IT industry.

Daegu-
Gyeongbuk
Research Center

Agricultural-IT Convergence Research Department

●

To ensure competitiveness in the agricultural sector of Korea, we are developing the intelligent greenhouse platform software which is Agricultural-IT Convergence Solution for cultivating various crops, vegetables and etc.

Firstly, our research efforts have been toward automatic environment measuring and actuator controlling based on well-known agricultural knowledge. This platform also provide interface for reflecting farmer's personal experience to increase production capacity. Finally, we make effort to feed forward control by mass environment simulation and prediction calculation to provide optimum growth environment to the plant.

Automotive-IT Convergence Research Department

●

To meet distributed and complex intelligent future vehicle electronics, we are developing the embedded SW platform technology based on the international standards and also developing the reliability guarantee technology to ensure the stability and reliability of embedded SW platform for automotive E/E.

The embedded SW platform for automotive E/E includes the real-time OS, middleware, and SW development tool, which can be applied to a variety of vehicle's electronic system as like power system, body, chassis, and so on.

Now, OSEK/VDX and AUTOSAR(Automotive Open System Architecture) based real-time OS for automotive E/E and SW development tool have been developed, can be applied to a variety of core automotive parts as like Blackbox, PAS(Parking Assist System), BSD(Blind Spot Detection), and so on.
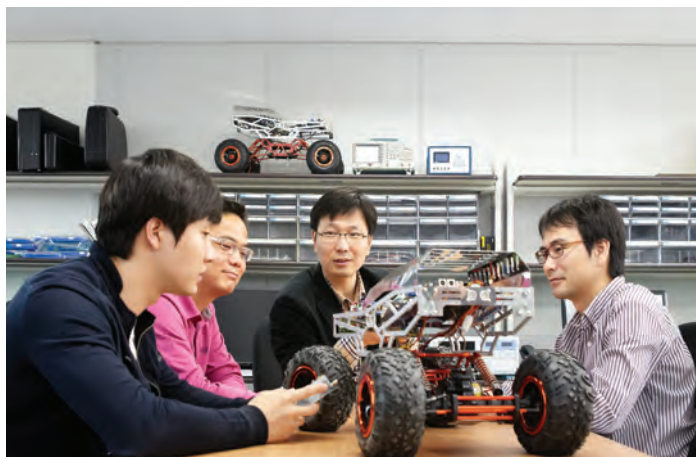
Research
Fields

SOURCE OF ECONOMIC GROWTH & NATIONAL DEVELOPMENT

The role of Technology Commercialization Division is to ensure that the ETRI serves as an innovative partner for technology commercialization. Its goals are promoting technology commercialization to facilitate industrial growth, securing intellectual properties which create value added, cooperating with SMEs and promoting overseas marketing. It focuses on building new Eco-Systems for technology commercialization and adding values to the technologies by implementing new business strategies to accomplish those goals. It also provides SMEs with support for technology and manpower, lays foundation to strengthen competitiveness of Start-Ups, operates Convergence Technology R&D Center, and actively collaborates with SMEs.

Technology Commercialization Division
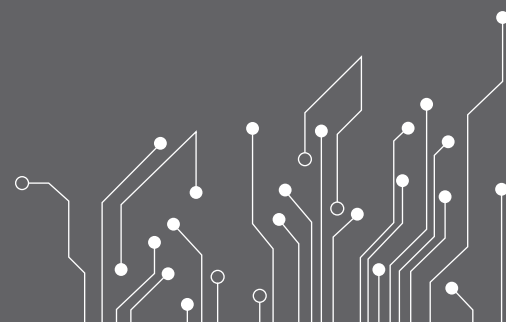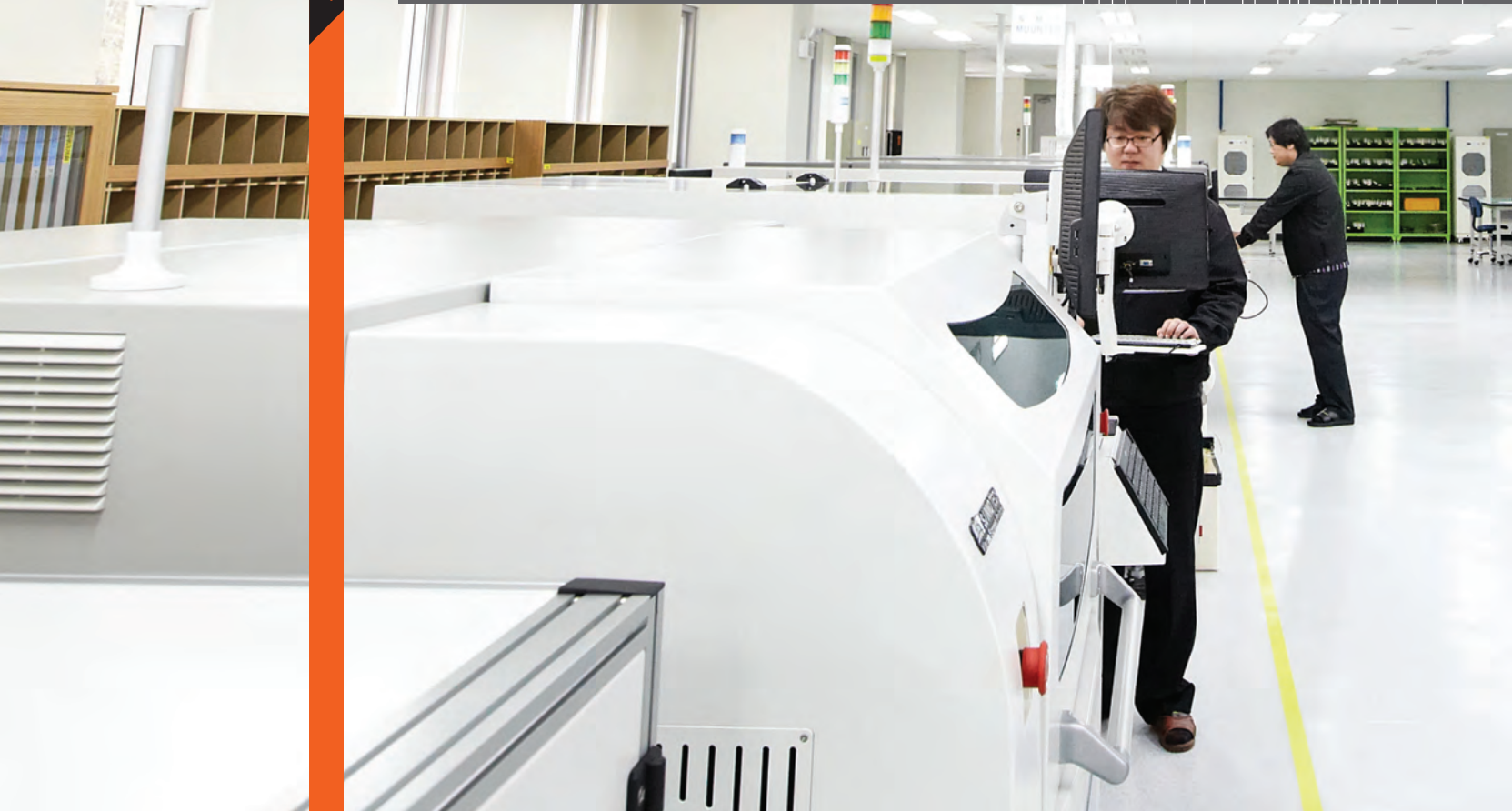
Intellectual Property Management Department

●

The Intellectual Property Management Department focuses on strategic planning to facilitate commercialization of core technologies developed by ETRI. Also, it plays key roles in securing excellent IP and boosting success rates of commercialization through building and implementing business strategies. To this end it implements various programs, e.g. tech development and demand prediction systems.

In order to improve IP productivity and realize the values offered by technology, it also carries out diverse activities, including the acquisition and management of IPR, contracting of acquired IP, active responses to infringements of intellectual property rights, transfer of ETRI technology to enterprises, patent marketing, expansion of the overseas patent licensing base, and participation in the international standard patent pool.

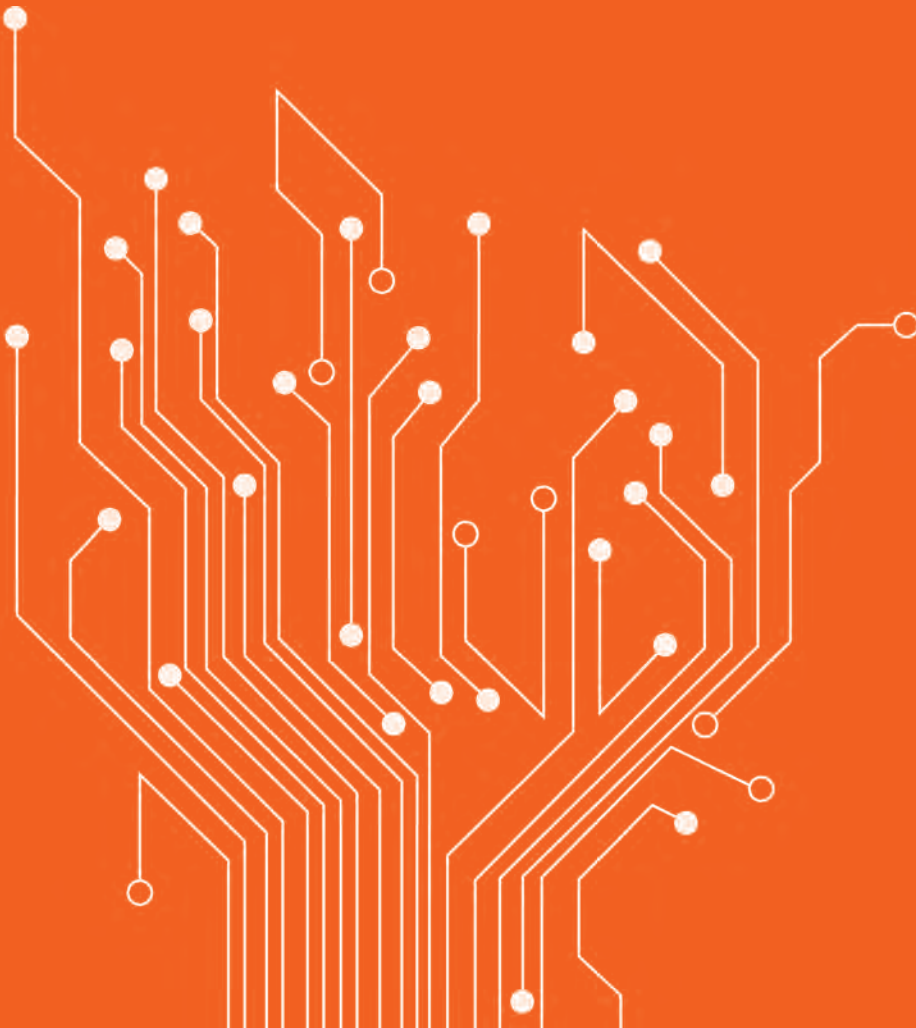## SMEs Cooperation Center

●

This center has the vision of being a support of SMEs in the IT and convergence sectors, so that these enterprise can lead the national economy. To this end, the center is establishing a strategy for cooperation between ETRI and SMEs, laying the foundation for venture start-ups, supporting the commercialization efforts of SMEs and expanding its internal and external cooperation activities. In addition, the center is providing tech support services for SMEs using ETRI's technology infrastructure, building the Convergence Technology Manufacturing center as a foundation for the convergence industry and production, and supporting and fostering enterprises

Overseas Research Centers (ETRI Beijing R&D Center, ETRI USA R&D Center)

●

These centers facilitate the commercialization of ETRI-developed technology in local sites and operate joint research projects with local businesses. To this end, the centers research the technologies and products required by local markets and identify promising technologies to be marketed globally, serving as a tech marketer based on a systematic tech PR network. In addition, the centers aim to strengthen their network for cooperation with overseas businesses and related organizations, expand customized support services, and reinforce marketing for ETRI technology-incorporated products in global markets, in order to facilitate joint research, technology transfer and joint ventures.

ETRI's
presence begets
the world's
future

With a transformative response to future changes,

ETRI is emerging as one of the top research institute in the IT community.

ETRI will continue to work for the future in creative innovative way with

its research ability and technology.
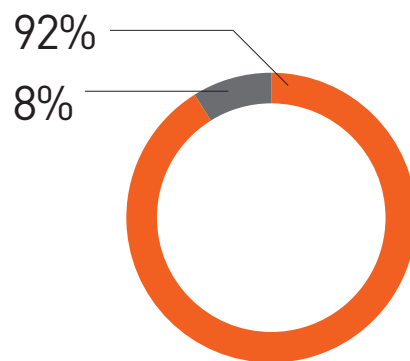
General Status

●

Personnel Status

Project Status

Patent Application

Technology Transfer

Standardization

SCI Papers

ETRI Alumni Companies

ETRI Laboratory Enterprise Status

Nationwide Research Center

Global R&D Cooperation Network

Personnel Status

● Total : 1,894(as of year 2011)

Type of Work

■ Research/Technical Staff : 1,737
■ Board Member/AdministrativeStaff : 157

Status of Degree Holding

■ Staff : Doctoral
■ Staff : Masters
■ Staff : Bachelors

92%
8%

41%
7%
52%
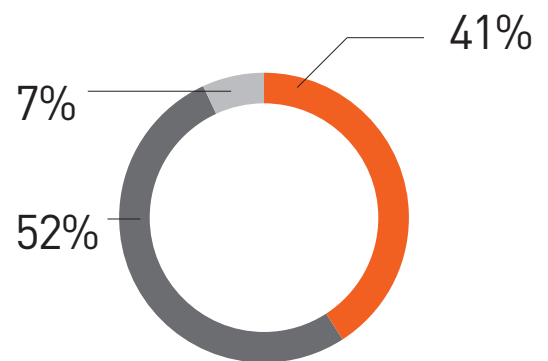
Project Status

● Num. of Project / Budget : 2,170 piece / 2 trillion 7,972 hundred million won(Total of past 5 years)

Number of Project(unit : cases)

547
515
442
332   334

2007 2008 2009 2010 2011

Budget(unit : million won)

599,126
589,343
528,483 532,678   547,618

2007 2008 2009 2010 2011

Patent Application

● **Num. of Patent Application : 18,639 cases** (Total of past 5 years)
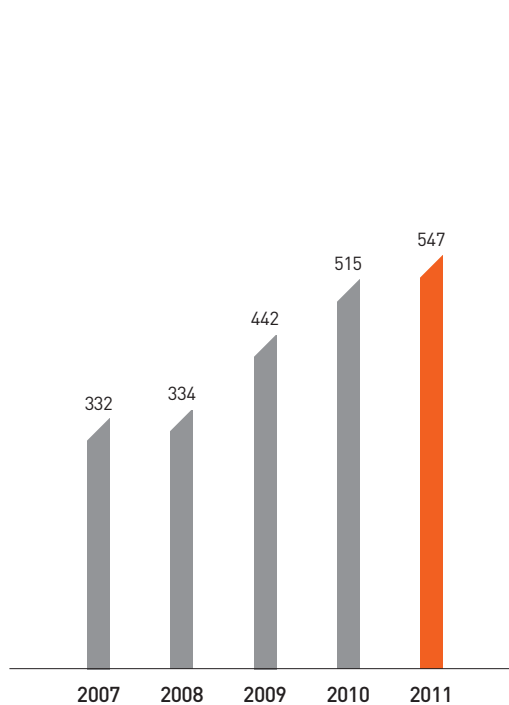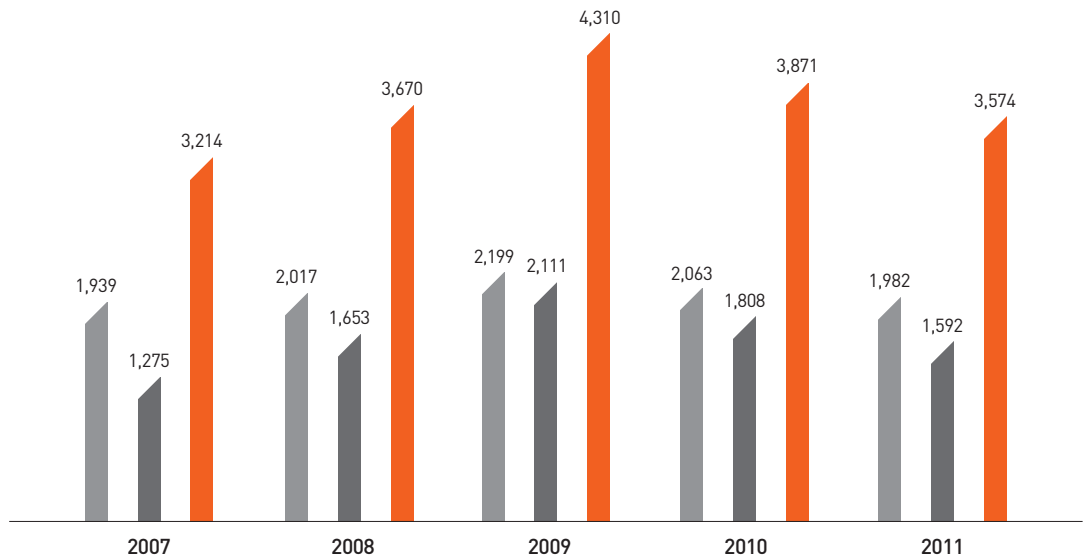
Num. of Patent Application (unit : cases)

■ Domestic
■ International
■ Total

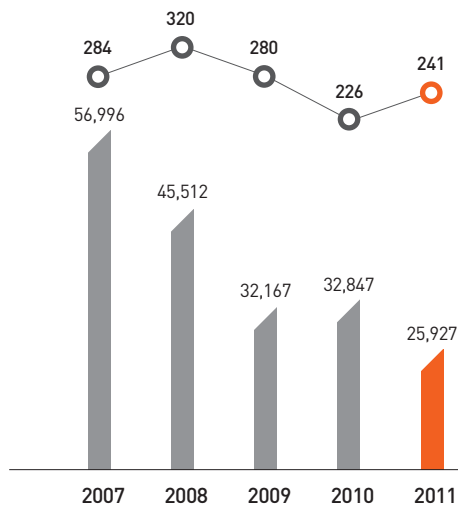|	2007	2008	2009	2010	2011
Domestic	1,939	2,017	2,199	2,063	1,982
International	1,275	1,653	2,111	1,808	1,592
Total	3,214	3,670	4,310	3,871	3,574

Technology Transfer

● **Num. of Technology / Royalty Income : 1,351 case / 1,934 hundred million won** (Total of past 5 years)
● **Num. of Technology Transfer Companies : 1,795 case** (Total of past 5 years)

Num. of Technology/Royalty Income
(unit : cases, million won)

◉ Number of Technology
■ Royalty Income

	2007	2008	2009	2010	2011
Number of Technology	284	320	280	226	241
Royalty Income	56,996	45,512	32,167	32,847	25,927

Num. of Technology Transfer Companies
(unit : cases)

■ Small and Medium sized Enterprises
■ Major Company
◉ Total

	2007	2008	2009	2010	2011
Total	377	420	369	300	329
Small and Medium sized Enterprises	355	389	347	285	307
Major Company	22	31	22	15	22
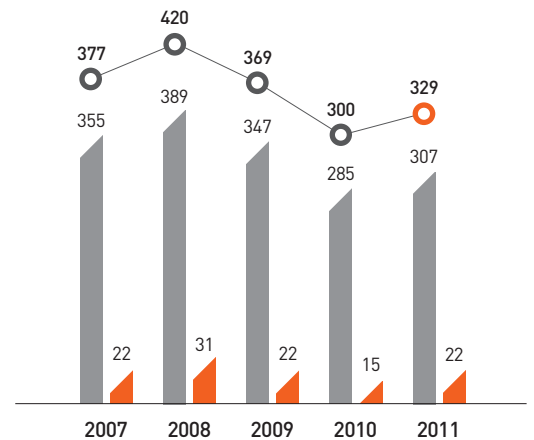
Standardization

● **Num. of Standards Contributions Adopted / Standard Experts**: 7,548 case / 480 (Total of past 5 years)

Num. of Standards Contributions Adopted (unit : cases)

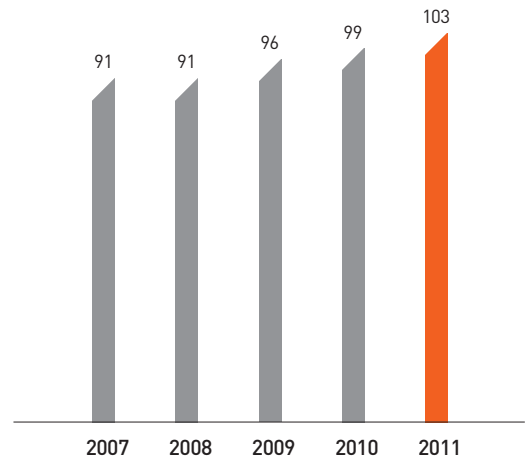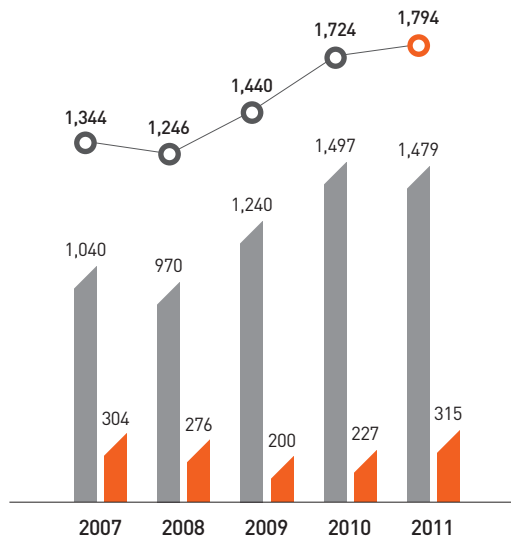■ International
■ Domestic
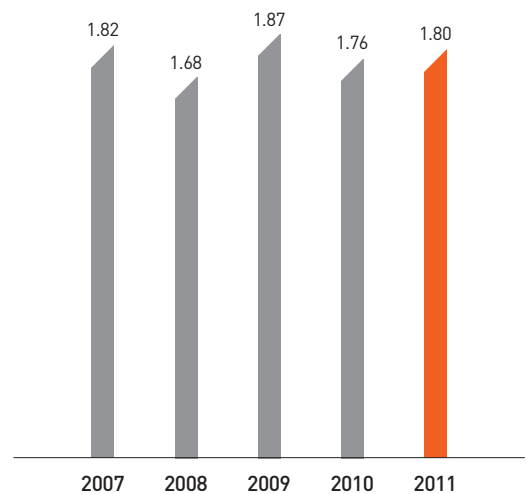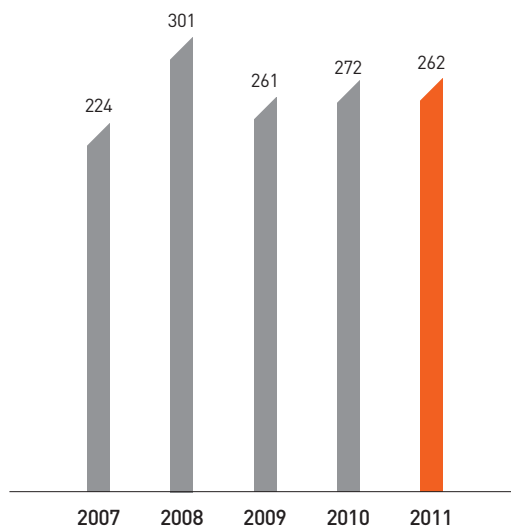◉ Total

Num. of Standard Experts

SCI Papers

● **Num. of SCI Papers / Average IF**: 1,320 case (Total of past 5 years) / 1.78 (Average)

Num. of SCI Papers (unit : cases)

Average IF (Impact Factor)

ETRI Alumni Companies

ETRI Alumni Companies

180
Number of Alumni companies

24
Number of Listed Companies

KOSPI : 4
KOSDAQ : 20

65
Billions
Average Sale

Among 108 Companies

Number of Alumni companies : 180
Number of Listed Companies : 24
TRIGEM COMPUTER Inc., Korea Data Communications Corp., ELEX COMPUTER Inc., COMTEC SYSTEMS Co., Ltd.,
APEX Inc., BIT COMPUTER Co., Ltd., HANDYSOFT Co., Ltd., Seodu inchip, Inc., Hi-per information & Communications Co,
Intelligent Telecommunications Inc., ARALION Inc., GIGA TELECOM INCORPORATED, KORNIC SYSTEMS,
LIGTHTRON FIBER-OPTICDEVICES Inc., INNOWIRELESS Co., Ltd., HAVIT Information Co., Ltd., KL Tech, Inc.,
ELK CORPORATION, RFSEMI TECHNOLOGIES Inc., XENER SYSTEMS Inc., S&S TECH Co., Ltd., NewGrid Inc.,
KOREA MATERIALS & ANALYSIS Co., Ltd., SECUVE Co., Ltd.

※Among 350 Laboratory Enterprise, currently 180 laboratory enterprise is active.

ETRI Laboratory Enterprise Status

Established 2007~2009
6 Companies

Established 2010
2 Companies

Established 2011
4 Companies

AUTUS Co., Ltd.
MACROGRAPH Co., Ltd.
BTWORKS Inc.
TestMidas Inc.
DBBro Corp.
3D Nuri Co., Ltd.

SOGWARE Inc.
Smart Q Technologies Inc.

INTRI Inc.
KCP INNOVATION Co., Ltd.
Accugen HealthCare Inc.
ARItel Inc.

In the past five years, ETRI has established 12 laboratory enterprises since year 2007. By managing the companies through a holding company, ETRI will be able to more successfully commercialize its research results, while fulfilling its role as the nation's growth engine for newmarket development and strengthening industries.

What is a laboratory enterprise?
A laboratory enterprise is a company that is established by combining excellent research results, owned by the government and public research institutes, with the capital and management knowledge of private enterprises. This will enable research institutes as technology suppliers and enterprises as users of the technology to form an innovation-oriented network so that technological competitiveness can be developed or transformed into industrial competitiveness, resulting in a competitive edge in the market.

Nationwide Research Center

● The Main Office(Daejeon)
Tel.+82.42.860.6114

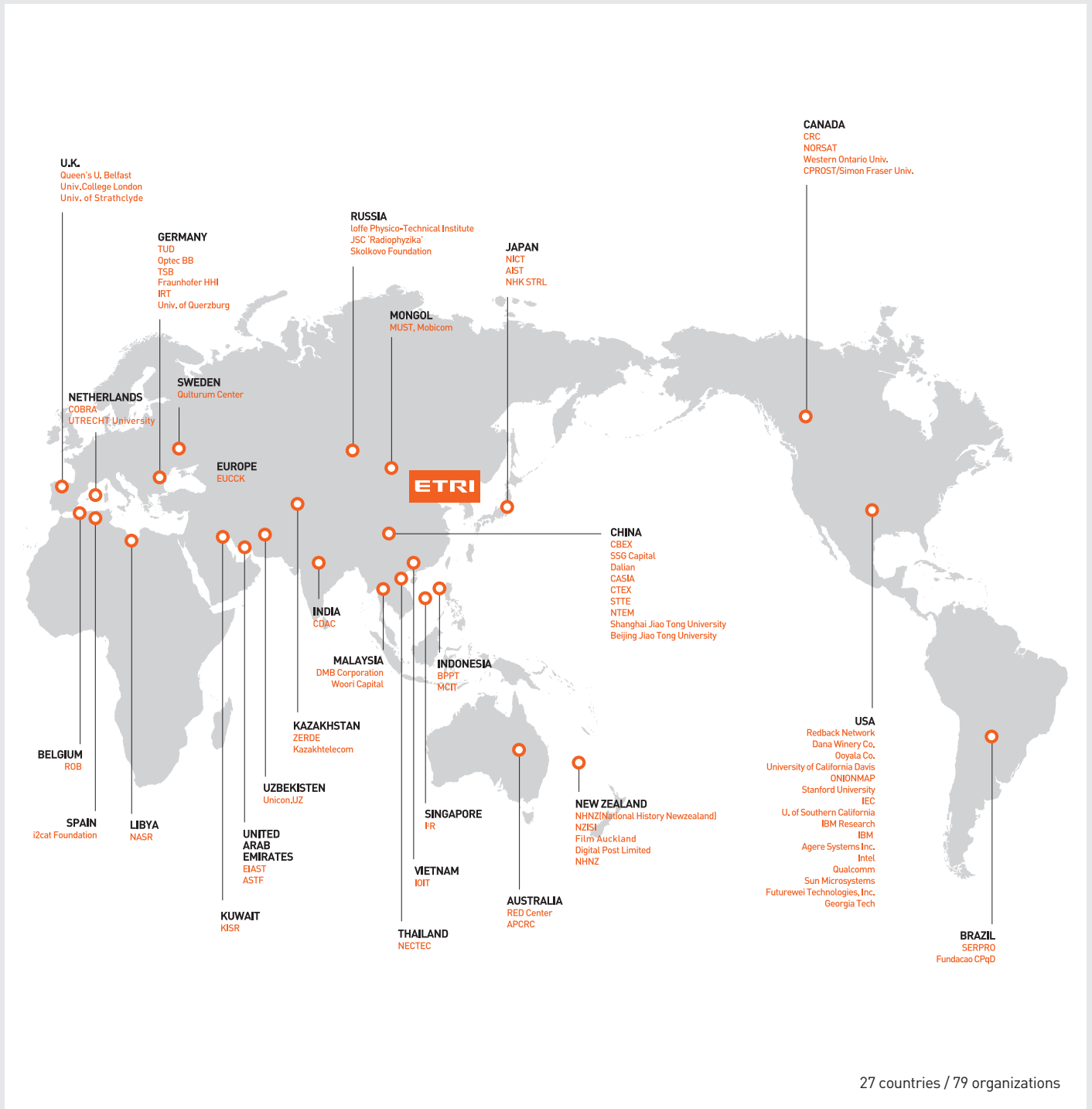## ● Seoul SW-SoC R&BD Center
Tel.+82.31.739.7200

● Honam Research Center
Tel.+82.62.970.6501

● Daegu-Gyeongbuk Research Center
Tel.+82.53.670.8000

Global R&D Cooperation Network

CANADA
CRC
NORSAT
Western Ontario Univ.
CPROST/Simon Fraser Univ.

U.K.
Queen's U. Belfast
Univ.College London
Univ. of Strathclyde

RUSSIA
Ioffe Physico-Technical Institute
JSC 'Radiophyzika'
Skolkovo Foundation

JAPAN
NICT
AIST
NHK STRL

GERMANY
TUD
Optec BB
TSB
Fraunhofer HHI
IRT
Univ. of Querzburg

MONGOL
MUST, Mobicom

SWEDEN
Qulturum Center

NETHERLANDS
COBRA
UTRECHT University

EUROPE
EUCCK

ETRI

CHINA
CBEX
SSG Capital
Dalian
CASIA
CTEX
STTE
NTEM
Shanghai Jiao Tong University
Beijing Jiao Tong University

INDIA
CDAC

MALAYSIA
DMB Corporation
Woori Capital

INDONESIA
BPPT
MCIT

BELGIUM
ROB

KAZAKHSTAN
ZERDE
Kazakhtelecom

USA
Redback Network
Dana Winery Co.
Ooyala Co.
University of California Davis
ONIONMAP
Stanford University
IEC
U. of Southern California
IBM Research
IBM
Agere Systems Inc.
Intel
Qualcomm
Sun Microsystems
Futurewei Technologies, Inc.
Georgia Tech

UZBEKISTEN
Unicon.UZ

SINGAPORE
I2R

NEW ZEALAND
NHNZ(National History Newzealand)
NZISI
Film Auckland
Digital Post Limited
NHNZ

SPAIN
i2cat Foundation

LIBYA
NASR

UNITED ARAB EMIRATES
EIAST
ASTF

VIETNAM
IOIT

AUSTRALIA
RED Center
APCRC

BRAZIL
SERPRO
Fundacao CPqD

KUWAIT
KISR

THAILAND
NECTEC

27 countries / 79 organizations

2012
ETRI
TECHNOLOGY
REPORT

ELECTRONICS AND
TELECOMMUNICATIONS
RESEARCH
INSTITUTE