R&D on Future Internet in Korea

Oct. 2009

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Future Internet Forum

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- Selected R&D Projects
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- Future Internet Forum

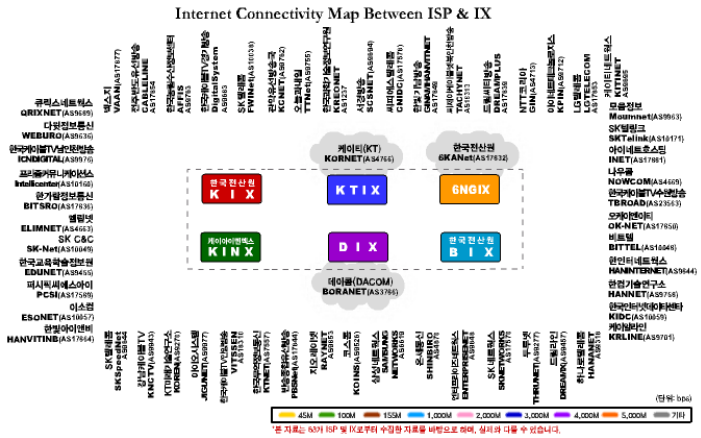
South Korea

- Population size : 49M
- Capital : Seoul
- Area : 100K Km2
- GDP : 13th

- Map of Korea

Internet in Korea

- Internet Users : 34.4 M
- Broadband Penetration
  - 93% (1st worldwide)



Big Players : Korean Internet Industries

- Portal
  - NHN
  - Daum
- Phone – wired
  - KT
- Mobile Phone
  - SKT
  - KTF
  - LGT

- Online Game
  - NcSoft
  - Nexon
  - Neowiz
- CDN
  - CD Networks
- Mobile devices
  - Samsung
  - LG
- Mobile WiMax
  - Samsung

Korean Research Organizations

- ETRI
  - >2000 researchers in IT areas
  - TDX, CDMA, NGN, 4G
- KISTI
  - Supercomputer services
  - National S&E Network
- KISDI
  - Policy on Telecom, Broadcasting
- NIMS
  - Basic research on Math
- Universities
  - SNU
  - KAIST
  - POSTECH
  - Many others

Why Future Internet ?

- Internet as of today is inadequate to support the future requirements
- Redesigning and rebuilding the net is needed
- Huge market is at stake (>1 trillions $/year)
- Huge influence on the future society
- Motivations are different by countries.
  - Security : US
  - Broadcasting, ubiquitous computing (sensors), mobility : Korea, EU

Future Internet : Differences

- Scale
  - 100 billions and more
- Service Diversity
  - Broadcasting
  - Communication
  - Sensors
- Business Model
  - Low entry cost
  - Innovation-driven
- Context and content aware services
  - Service composition
  - Dynamic service
- Future-proof architecture
- Security
  - Reliability
  - Availability
  - Privacy
- Ubiquity
  - Always connected
  - Mobility
  - Sensing, detecting, linking
- Social network, cyber network, data network
  - Tight interaction

Future Internet : Basic Concepts

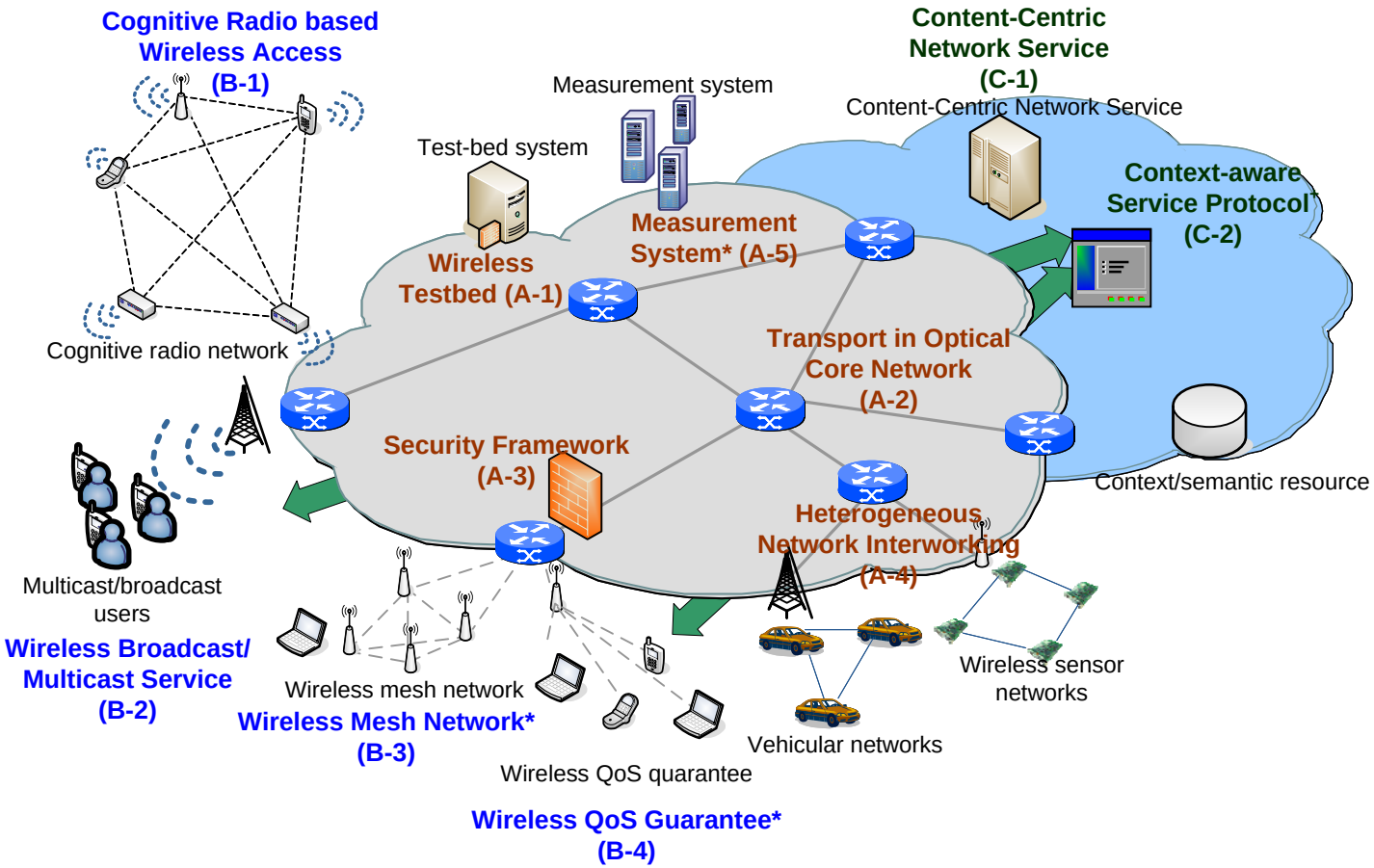
- Multi-network as one platform
  - Today's net is one network for multi-services
- Heterogeneity by virtualization
  - Multiple virtual platforms coexisting on top of one physical platform
- Collaboration between Network, application, contents and, user devices
  - Co-design
- Security in the core
  - Not an add-on feature

Research Project : Fundamental Technologies for Future Internet

- R&D Planning (through Future Internet Forum)
  - Identify long-term R&D topics
  - Predict the future technologies
  - Promote collaborations
- Work on selected research topics (universities)
  - Architecture
  - Wireless
  - Services
- Participation to Standard Activities
  - IETF, ITU, IEEE, ISO, forum etc.

- First R&D project on Future Internet
- 2007-2009 (3 years)

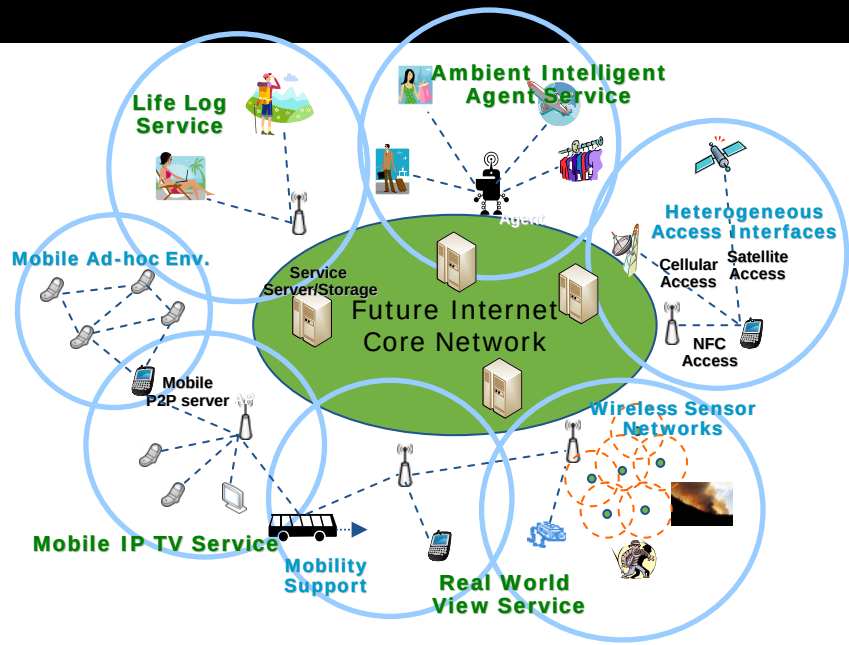
Research Topics - 2009

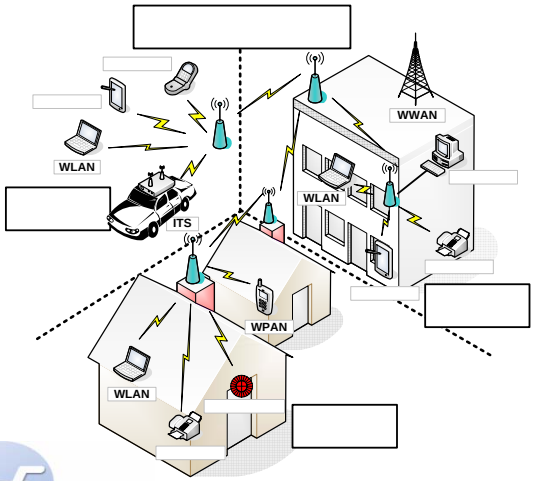


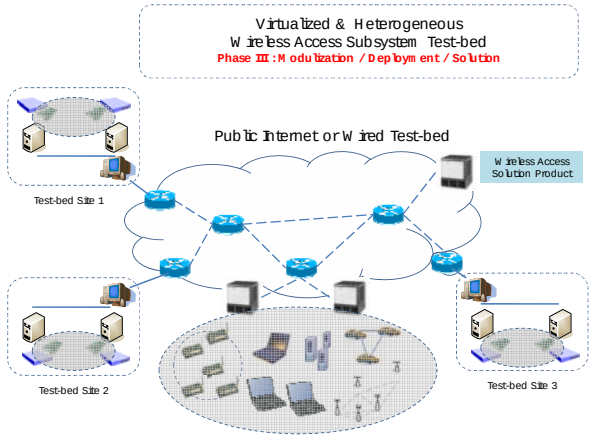
Internet Architecture: A Wireless Access: B Service and Application: C	Seoul National University KAIST (*) ICU (+)

R&D Planning

- Big National R&D Program on FI
- Examples
  - Emergency Network
  - Mobile Service for the Future Internet
  - Heterogeneous Wireless Access Subsystem
  - Content-centric Network
  - Multi-hop Wireless Network

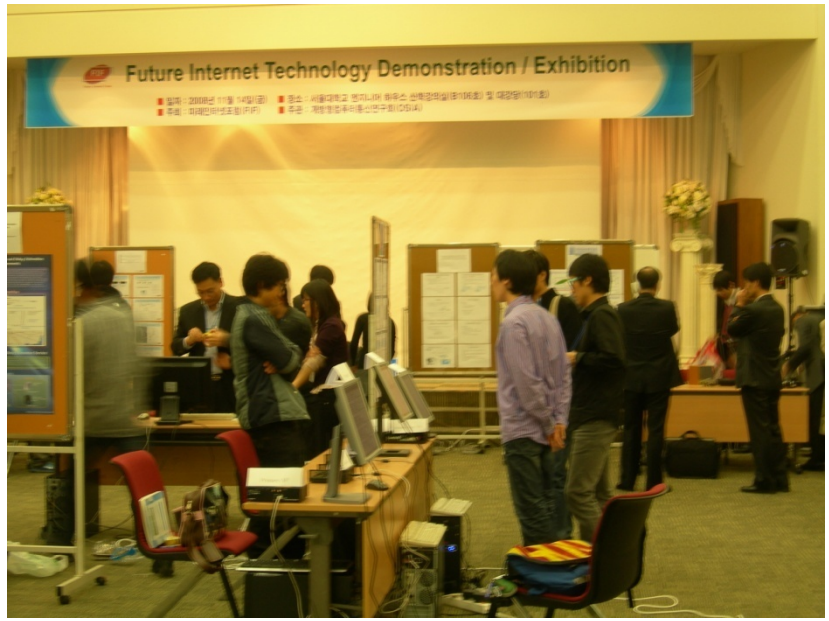






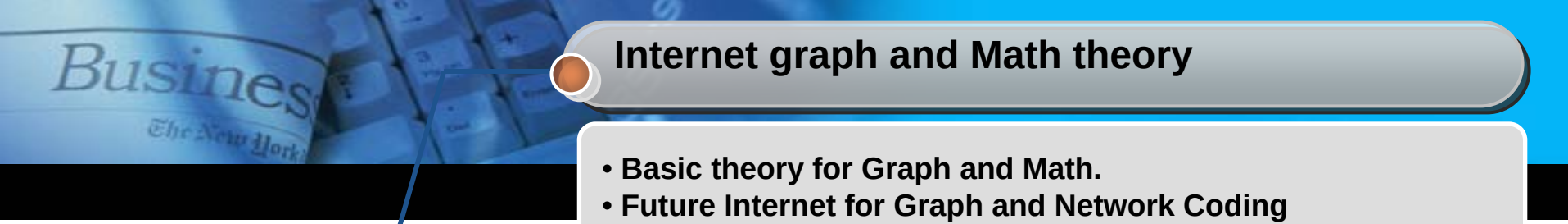
FI Demo Event

- Nov. 14, 2008, Nov. 18, 2009
- 17 demos presented



Research Project : Models for Future Network

- Network Science and Engineering
  - Focused on theoretical and practical models for Future Internet
- Participating organizations
  - National Institute for Mathematical Studies ; math group
  - Seoul National University ; computer science group
  - Korea Advanced Institute of Science and Technology ; physics group
- Project funded and managed by Korea Research Council of Fundamental Science and Technology
- 2009 - 2014



Developing Future Internet Network Model

Internet graph and Math theory

- Basic theory for Graph and Math.
- Future Internet for Graph and Network Coding
- Developing Internet Graph Network Model

Development of Cryptographic Algorithms for Future Internet Security

- Lightweight Public-key Cryptographic Algorithms for Designing Secure Networks
- Efficient Anonymous Authentication System
- Privacy-preserving Cryptographic Algorithms

Internet Technologies

- Modeling of Web
- Internet Traffic Analysis
- Modeling of Wireless Networks
- Modeling of Content Networks

Understanding Future Internet for Information/Data

- Network of Everthing(Socio/Bio/Data/Transport Networks
- Future Web/Internet(SNS/Mobile/Wierless Networks
- Graph/Network Analysis(Network Evolution & Dynamics)

Center for Next-generation Network & Services research

- Missions
  - Develop network design methodologies for Future Internet
  - Propose frameworks for advanced Future Internet services
  - Develop network access methods using diverse wired and wireless network techniques
  - Train highly competitive ICT experts
  - Foster industries related to future networks

- Established in 2008 at Seoul National University
  - Prof. Chong-kwon Kim
  - 14 professors from six universities in Korea
  - About100 graduate students

CENNS
CEnter for Next generation Network & Services research

CENNS Research Areas

Networks and Protocols

- Addressing scheme to support scalability, miobility, and security
- Virtualization over Multi-Core Systems
- Optical network at Tera/Petabit speed
- New Transport Protocol for QoS guarantee, and easy management
- Tools for Network Performance Measurement and Evaluation

Service Technology

- Service Architecture for Massive number of Prosumers
- New Service Framework for Context-aware Services
- Efficient Content Search Technologies

Heterogeneous Wireless Access Methods

- Scalable and Flexible Wireless Sensor Network Architecture
- Adaptive MAC and Routing in Multi-network Environment
- Ad-hoc and Mesh Network in Internet
- Adaptive Wireless Transport Protocol for Mobile Multimedia Applications
- Integrated Programmable System Platforms for Wireless Network

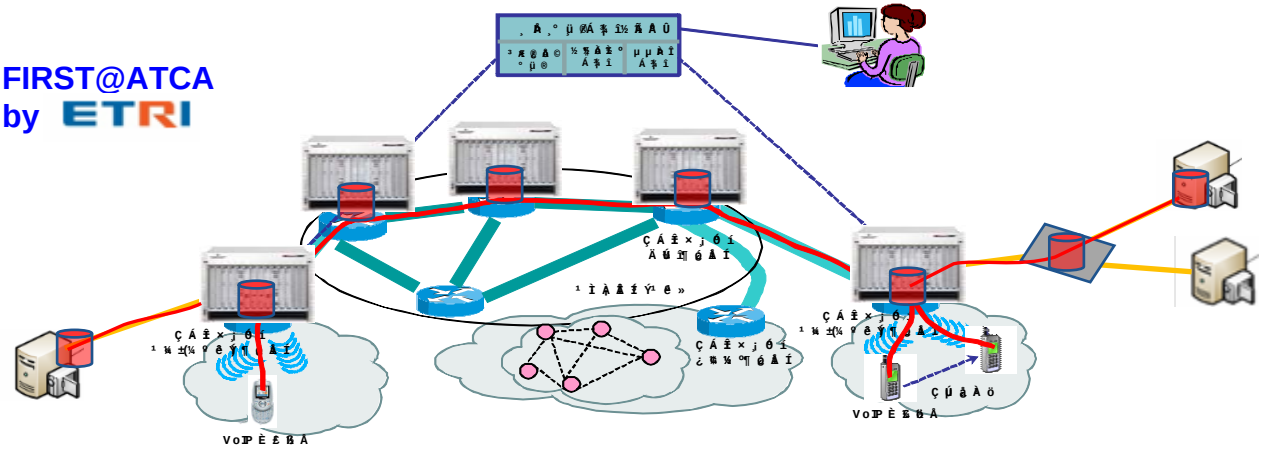
Future Internet Platform Project

Development of the core technology and virtualized Programmable platform for Future Internet

❖ Goal

- Development of the core technology for **programmability** and **network virtualization**
- Development of the **platform technology** for realizing architectures and services of future internet

FIRST@ATCA
by ETRI



FIRST@PC
by GIST, CNU, KAIST, PosTech, KHU

Future Internet Forum

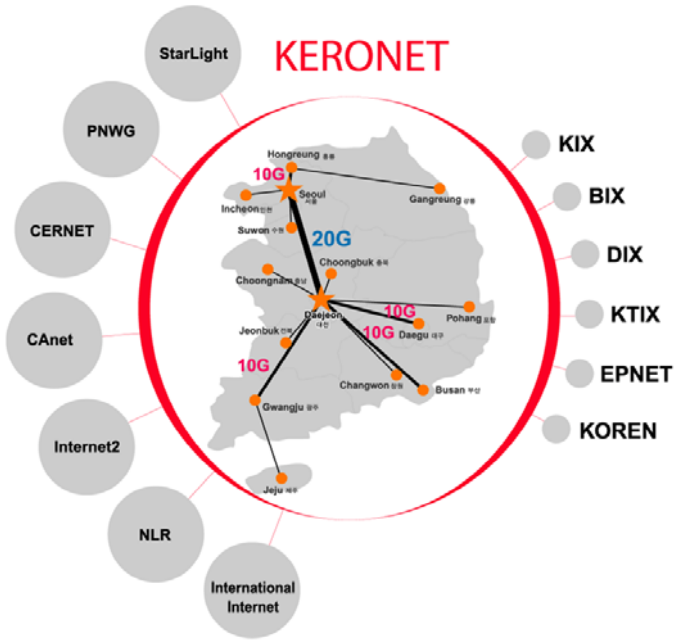
- Established in 2006 to promote R&D collaborations in Future networking
- Building research communities
- http://fif.kr
- Workshops, seminars, publications

- International Conferences (annual)
  - "Internet of the Future", 2006
  - International Future Internet Workshop 2007
  - International Conference on Future Internet 2008
  - CFI 2009, June 17-19, Seoul, Korea
- Future Internet Camp (twice a year)
  - 2007 Aug. 20-22
  - 2008 Feb. 18-22 (with AsiaFI school)
    Aug. 25-28 (with AsiaFI school)
  - 2009 Feb. 23-26, SNU
    Aug. 24-28, Jeju, Korea

Network Testbeds

❖ KOREN

❖ KREONET



AsiaFI

- Asia Future Internet Forum
- http://www.asiafi.net/
- Board
  - Chair: Jun Murai
  - Vice Chair: Daeyoung Kim
  - Members: Xing Li, Onno Purbo, Lixia Zhang, Kenjiro Cho, Yanghee Choi, Serge Fdida, Francis Lee
- Testbed committee
- WG
  - Architecture and building blocks
  - Mobile & wireless networks
- Secretariat
  - Jun Bi, Choong Seon Hong, Koji Okamura

- Steeing Group

- Kilnam Chon, KAIST
- Choongseon Hong, Kyunghee University
- Xiaohong Huang, BUPTNET
- Akira Kato, WIDE
- Dongman Lee, KAIST
- Taekyoung Kwon, Seoul National University
- Koji Okamura, Kyushu University
- Sureswaren Ramadass, NAV6
- Mingwei Xu, Tsinghua University
- Jun Bi, Tsinghua University
- Rodney van Meter, Keio University

Korean Policies on FI

- Open Research : Experts from various sectors free to join
- Selection & Concentration : based on competitiveness
- Global Cooperation : Europe, CJK, USA
- National Agenda : Long-term big national initiatives

Contact Points

- Professor Younghee Lee (KAIST)
  - PM for Future Internet
  - Korea Communications Commission
- Professor Jeong-A Lee (GIST)
  - PM for EECS (including Future Internet)
  - Korea Research Foundation
- Professor Yanghee Choi (SNU)
  - Director, Future Internet Forum
- Professor Chongkwon Kim (SNU)
  - Director, CENNS (ITRC)

Conclusion

- Future Internet is a popular research area in Korea
- Many global cooperation programs
- Emphasis on wireless, access network technologies, and mobile applications
- Open platforms for network & terminal devices
- Forum is important to bring people together