الجامعة المصرية اليابانية للعلوم والتكنولوجيا

E-JUST

Egypt-Japan University of Science and Technology

エジプト日本科学技術大学

Egypt-Japan University of Science and Technology
الجامعة المصرية للعلوم والتكنولوجيا
جامعة حكومية ذات شراكة يابانية

President Ahmed Khairy
Prof. Dr. Mohamed El-Sharkawy

The 2nd JAEF 2010

1

Role of E-JUST in linking Egypt and Arab World to Japan's Advanced IT and Technology

The 2nd JAEF 2010

Egypt-Japan University of Science and Technology (E-JUST)

www.ejust.edu.eg

- **Introduction to E-JUST**

- **Role of E-JUST in linking Egypt and Arab World to Japan's Advanced IT and Technology**

  - E-JUST Facilities and Research Centers
  - Examples of E-JUST IT Infra-Structure Projects
  - Examples of E-JUST Research Projects

3

E-JUST Introduction

The 2nd JAEF 2010

www.ejust.edu.eg

E-JUST Vision

- **Three broad disciplines:**
  - **Science and Technology.**
  - **Humanities and Business.**
  - **Life Sciences (10 years +).**
- **Regional and global synergies to reach out for students, academic staff and researchers in the region and beyond .**
- **building relationships of cooperation with renowned academic and research institutions all over the world.**

5

Basic Concept of E-JUST

National University Based on Partnership
Between Egypt and Japan

A First Class, Leading University
（To serve Egypt, Middle East and Africa）

Role Model For Egypt's 21st Century Universities
and a Spearhead for Higher Education Reform in Egypt

Research Oriented, Graduate Focused University

Japanese Style Approach
（Lab Based Education, Practical & Problem Solution Oriented）

Unique Academic Programs
(close interaction with Industry, multidisciplinary, ICT utilization..)

Academic Programs

Two Faculties

– **Engineering : 7 Programs**

- Electronics and Communication Engineering
- Energy Resources and Environmental Engineering
- Mechatronics and Robotics Engineering.
- Computer Science and Engineering.
- Industrial and Manufacturing Engineering.
- Materials Science and Engineering.
- Chemical and Petrochemical Engineering.

– **Business and Humanities : 2 Programs**

- International Business Management
- Cross-Cultural Management and Japanese Studies
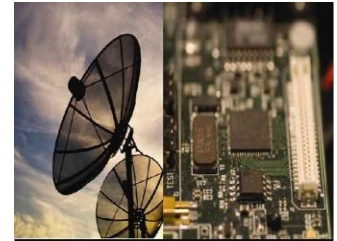
E-JUST Supporting Bodies

- **Egypt:**
  - **Egyptian government.**
  - **Consortium of Egyptian governmental universities.**
  - **Mubarak city for scientific research and technology applications (MuCSAT).**
  - **Bibliotheca Alexandrina.**
  - **Alexandria and New Borg el Arab business societies.**

www.ejust.edu.eg

Linking Egypt and Arab World to Japan's Advanced IT and Technology

The 2nd JAEE 2010

Egypt-Japan University of Science and Technology (E-JUST)

E-JUST Supporting Bodies

- **Japan:**

    – **Japanese government.**

    – **A consortium of 12 top Universities from Japan.**

    – **Japan business and industrial society.**

Egypt-Japan University of Science and Technology (E-JUST)

www.ejust.edu.eg

Japanese Supporting University Consortium (JSUC)

KYOTO UNIVERSITY FOUNDED 1897 JAPAN

Waseda University

KYUSHU UNIVERSITY

東京工業大学
Tokyo Institute of Technology

Keio University

RITSUMEIKAN

Osaka University

Nagoya University

東北大学
TOHOKU UNIVERSITY

Kyoto Institute of Technology

HOKKAIDO UNIVERSITY

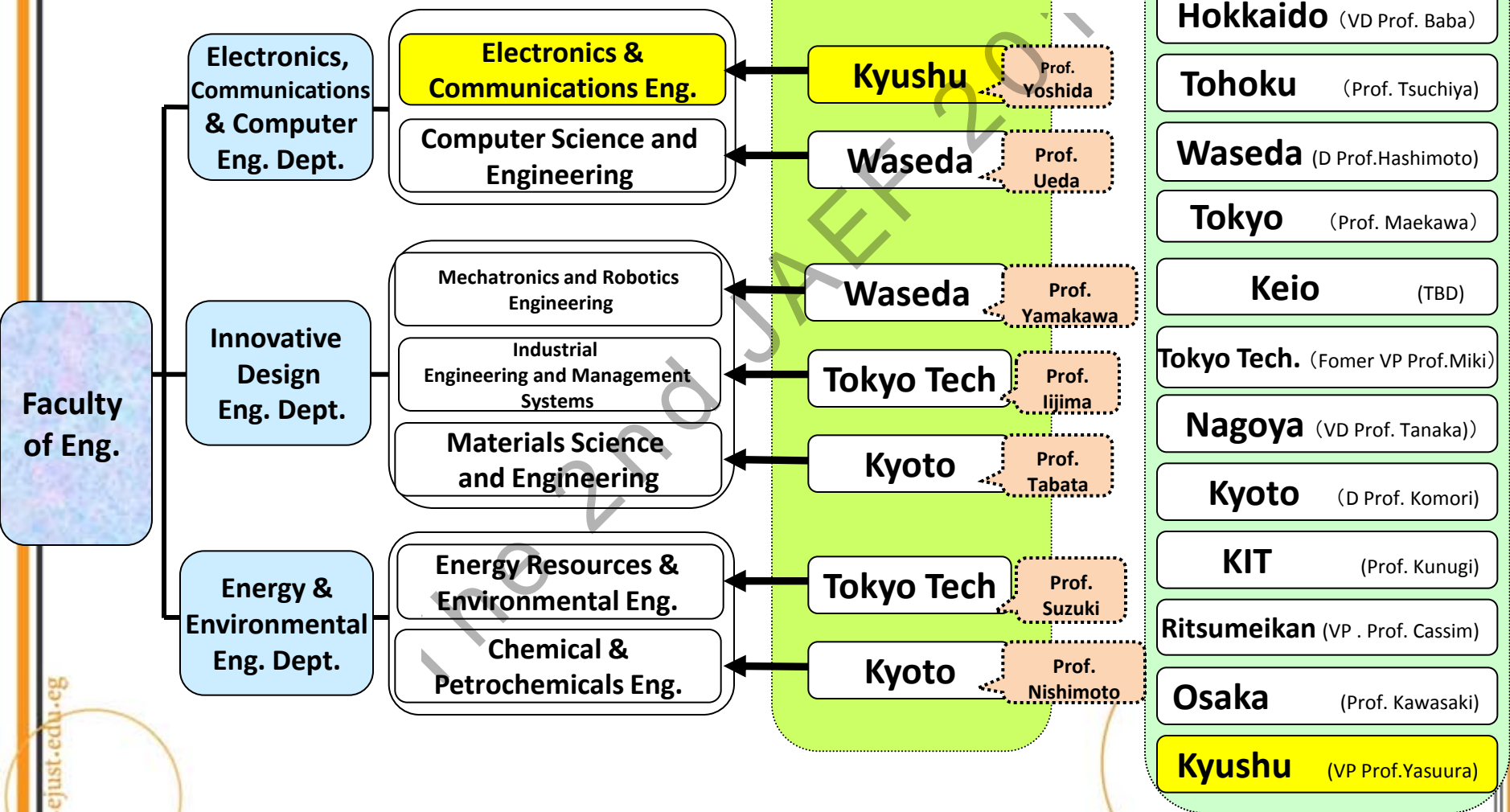THE UNIVERSITY OF TOKYO

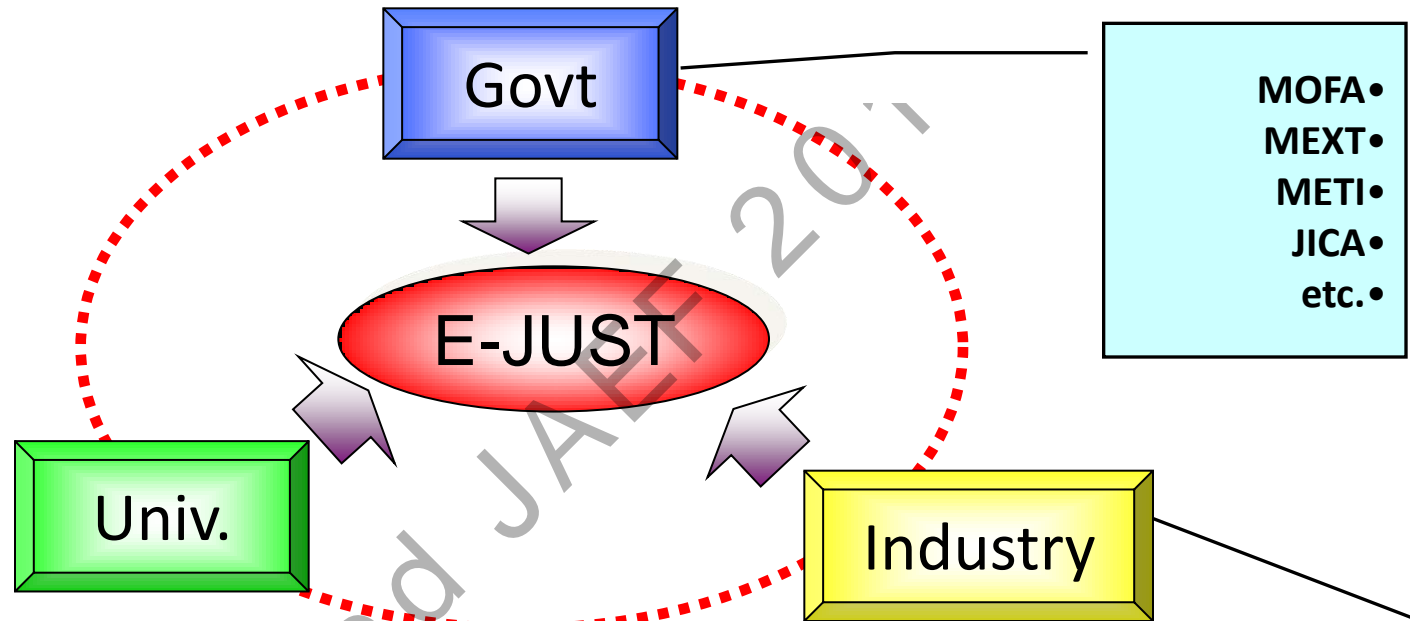Egypt-Japan University of Science and Technology (E-JUST)

Clustering of JSUC by Programs

Play main role in supporting each program.
For each program, 1 main supporting univ.

Main Program Supporting Univ.

JSUC

Faculty of Eng.

Electronics, Communications & Computer Eng. Dept.

- **Electronics & Communications Eng.** ← **Kyushu** — Prof. Yoshida
- **Computer Science and Engineering** ← **Waseda** — Prof. Ueda

Innovative Design Eng. Dept.

- **Mechatronics and Robotics Engineering** ← **Waseda** — Prof. Yamakawa
- **Industrial Engineering and Management Systems** ← **Tokyo Tech** — Prof. Iijima
- **Materials Science and Engineering** ← **Kyoto** — Prof. Tabata

Energy & Environmental Eng. Dept.

- **Energy Resources & Environmental Eng.** ← **Tokyo Tech** — Prof. Suzuki
- **Chemical & Petrochemicals Eng.** ← **Kyoto** — Prof. Nishimoto

JSUC

- **Hokkaido** （VD Prof. Baba）
- **Tohoku** （Prof. Tsuchiya）
- **Waseda** (D Prof.Hashimoto)
- **Tokyo** （Prof. Maekawa）
- **Keio** (TBD)
- **Tokyo Tech.** （Fomer VP Prof.Miki）
- **Nagoya** （VD Prof. Tanaka)）
- **Kyoto** （D Prof. Komori）
- **KIT** (Prof. Kunugi)
- **Ritsumeikan** (VP . Prof. Cassim)
- **Osaka** (Prof. Kawasaki)
- **Kyushu** (VP Prof.Yasuura)

The 2nd JAEF 2010

www.ejust.edu.eg

E-JUST Japanese Supporting System

Govt

E-JUST

Univ.

Industry

- MOFA
- MEXT
- METI
- JICA
- etc.

JSUC (12Univs+α)

○**General Coordination (rotational basis)**

Waseda (President)、Kyusyu (President) , Kyoto (President)

○**JSUC (Japanese Supporting Univ. Consortium)**

Hokkaido、Tohoku、Waseda、Tokyo、Keio、TITech、Nagoya、Kyoto、KIT、Rits、Osaka、Kyusyu＋α

- JCCI
- JCCME
- MERIJ
- etc.

JCCI: Japan Chamber of Commerce and Industry
JCCME: Japan Cooperation Centre for the Middle East

ICT Facilities and Research centers

- **Smart City Facility**
- **The Wireless Research Facility**

- **Others Supporting Facilities and Centers:**
  - **Alexandria Regional Nanotechnology Research Center**
  - **Innovative Facility for Product Development and Prototyping**

14

Centers of Research Excellence Future Goal

- **Energy Resources and Management**

- **Electronics /Mechatronics**

- **High Tech Training and Continuing Education**

Smart City Facility

General Director: Dr. Ahmed El-Mahdy

General Research Theme

- Problem: Alexandria suffers from common large scale problems associated with its huge population.
- The main objectives are to:
  - Provide **for better quality of life**
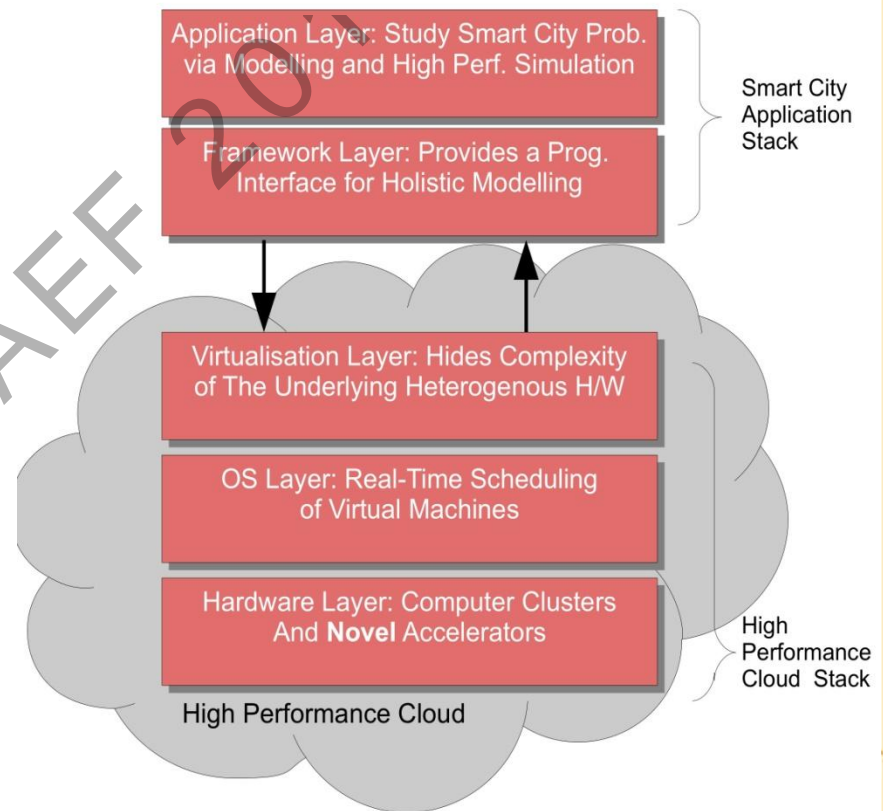 - And **better use of resources** in mega-cities

Traffic
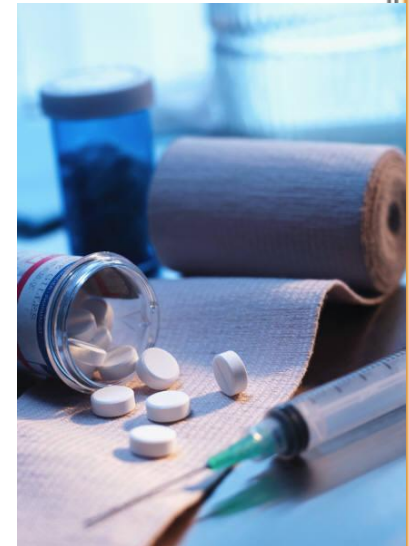
Health
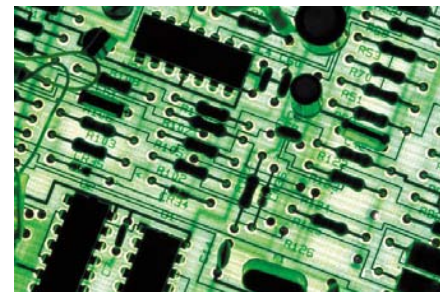
ICT

...

Smart City Facility

Challenges/Approach:

- Main Goal: Reduce Inefficiency in Complex Interacting Systems of Mega-Cities:
  - There are currently 4 Trillion USD that can be saved yearly from all over the word
- Challenges: Research & Develop 'holistic' models for various city systems
  - Utilise **Multi-Agent** Modelling
  - Multi-Disciplinary member teams with diverse expertise
- Provide for necessary **programming model** for such models
  - Utilise distributed parallel computing paradigms
- Provide for low cost, high performance computing to analysis the models
  - Research/Develop High Performance Cloud Computing to allow for sharing computing resources
  - Utilise low cost hardware accelerators (like GPUs) to provide for high performance
- Provide for necessary instrumentation structure
  - Use of mobile phones localisations

Application Layer: Study Smart City Prob. via Modelling and High Perf. Simulation

Framework Layer: Provides a Prog. Interface for Holistic Modelling

Smart City Application Stack

Virtualisation Layer: Hides Complexity of The Underlying Heterogenous H/W

OS Layer: Real-Time Scheduling of Virtual Machines

Hardware Layer: Computer Clusters And **Novel** Accelerators

High Performance Cloud

High Performance Cloud Stack

- **Executive Committee:**
  - Prof. Dr. Ahmed Khairy, President of E-JUST, Egypt.
  - Mr. Amir Wassef, Borg Al Arab Industry Representative, Alexandria, Egypt.
- **Steering Committee:**
  - Dr. Mohamed El-Sharkawy, Chair of Research Committee, E-JUST, Egypt
  - Dr. Hisham El-Shishiny, IBM, Egypt
  - Dr. Walid Gomaa, E-JUST.
  - Dr. Ahmed El-Mahdy, Director of Smart City Facility, E-JUST, Egypt
  - Dr. Noha Adly, Deputy Head, ICT Sector, Bibliotheca of Alexandria
  - Dr. Noha A. Yousri, E-JUST.

- Japanese Side:

  - Prof. Dr. Kazunori Ueda, Waseda University, Japan
  - Prof. Dr. Hironori Kasahara, Waseda University.
  - Dr. Keiji Kimura, Associate Professor, Waseda University, Japan
  - Dr. Wada Yasutaka, Assistant Professor, Waseda University, Japan. Prof. Dr. Zen Kawasaki, Osaka University, Japan.
  - Member from IBM center for advanced studies at Tokyo (Pending)

18

The Wireless Research Facility

Director: Dr. Moustafa Youssef

- It aims at establishing a world-class cross-disciplinary research facility with close-ties to the industry, both at the national and international levels.

- It provides both basic and applied research in wireless networking and communications, their applications and their hardware implementations.

19

The Wireless Research Facility

- It contains three inter-related core groups covering different stages of wireless system development:

  – Wireless Networking Group

  – Wireless Communications Group, and

  – Radio Frequency Design Group.

20

Egypt-Japan University of Science and Technology (E-JUST)

I. Wireless Networking Group

Directed by: Dr. Moustafa Youssef

- It provides both basic and applied research in wireless networking and its applications from the Medium Access Control (MAC) to the application layers of the protocol stack.

- Areas of interest include cellular technologies, wireless data networks, sensor networks, RFID technology, vehicular networks, and wireless networking security.

21

II. Wireless Communications Group

Directed by: Dr. Mostafa El-Khamy

- Provide theory, algorithms, protocols, designs and implementations for next-generation wireless communication systems at the physical and MAC layers.

- The main research themes are:
  - Enabling energy-efficient mobile broadband wireless communications.
  - Developing intelligent vehicular networks and self-organizing networks
  - Providing necessary technology and services for deploying adaptive cooperative wireless communication networks for both high throughput and delay sensitive applications.

22

III. Radio Frequency Design Group

Directed by: Dr. Ahmed Allam

- It aims at the transformation of wireless ideas into reality products.

- This group addresses the design, implementation and testing of innovative radio frequency solutions in CMOS and related technologies.

- Technologies covered are broadband, cellular and telemetry applications.

23

- **Executive Committee**
  - Prof. Dr. Ahmed Khairy, President of E-JUST, Egypt.
  - Prof. Dr. Mohamed Ragab, E-JUST, Egypt.
  - Mr. Amir Wassef, Borg Al Arab Industry Representative.

Steering Committee

(Egyptian Side)
  - Directors of the Research Wireless Facilities, E-JUST.
  - Prof. Dr. Mohamed El-Sharkawy, Chair of Research Committee, E-JUST.

  - Prof. Dr. Hesham El Deeb, Supervisor for IT Infrastructure Sector at Ministry of Information and Communications, Egypt.
  - Alaa Zaher, Vodafone Representatives .
  - Dr. Ismail Mashhour, CEO, SYSTEL Egypt.
  - Dr. Tarek Elabaddy, Director, Cairo Microsoft Innovation Center (CMIC), Egypt.

The 2nd JAEF 2010

- **Steering Committee**

  (Japanese Side)

  – Prof. Dr. Keiji Yoshida, Kyushu University, Japan.

  – Prof. Dr. Kazuaki Murakami, Kyushu University, Japan

  – Prof. Dr. Hiroshi Furukawa, Kyushu University, Japan .

  – Prof. Dr. Zen Kawasaki, Osaka University, Japan.

– Industry representatives, Japan (TBD).

– Dr. Osamu Muta, Center for Japan-Egypt Cooperation in Science and Technology

Other Supporting Facilities and Research centers

- **Innovative Facility for Product Development and Prototyping**

- **Alexandria Regional Nanotechnology Research Center**

26

www.ejust.edu.eg

Innovative Facility for Product Development and Prototyping

General Director: Dr. Masoud Alghoniemy

- Provide technical support and consultation by Egyptian and Japanese faculty and staff including project management, source allocation and scheduling.

- Team with enterprises in writing proposals to funding agencies such as ITIDA, STDF, etc.

- Make engineering tools affordable, accessible, and relevant to small and medium enterprises (National Instruments Planet **Nurturing Innovation (Planet NI))**.

Innovative Facility for Product Development and Prototyping

- Linking small and medium enterprises with National Instruments experts to provide technical training on NI equipments and access to world class applications and technical support.

- Provide support for small business through social funds such as the Egyptian Social Fund for Development (SFD). (pending)

28

Innovative Facility for Product Development and Prototyping

Research Groups:

- RF and Wireless Products. Director: Dr. Masoud Alghoniemy.

- Software Products. Director: Dr. Ahmed El-Mahdy.

- Vision and Robotics Products. Director: Dr. Ahmed Ramadan.

- Green Energy and Energy Technology Products. Director: (To be nominated).

- Management and Planning of Products: Director: Dr. Amr Eltawil.

29

Innovative Facility for Product Development and Prototyping

Executive Committee:

Prof. Dr. Ahmed Khairy, President of E-JUST, Egypt.

Steering Committee:

Directors of the facility.

Dr. Mohamed El-Sharkawy, Research Committee.

Eng. Michel Haddad, NI Arabia.

Eng. Sherif Ismail, NI Arabia.

Dr. Nermin Haraz, Assistant Professor, E-JUST, Egypt.

30

Alexandria Regional Nanotechnology Research Center

Director: Dr. Ahmed Abd El Moneim

- **It works in complete cooperation with Egypt Nanotechnology Research Center in Cairo.**

- **It performs joint research activities utilizing the financial and human resources of :**

  – **Regional Nanotechnology Research Center in Alexandria and**

  – **Egypt Nanotechnology Research Center in Cairo.**

Alexandria Regional Nanotechnology Research Center

- **It prepares Egyptian Researchers in the fields of advanced technology in general and in Nanotechnology in particular.**

- **It links the scientific research with industry through partnerships, transfer and implementation of advanced technology.**

32

Part II
Examples of E-JUST ICT Projects

Egypt-Japan University of Science and Technology (E–JUST)

The 2nd JAEF 2010

www.ejust.edu.eg

I. EJUST
Infrastructure Projects

The 2nd JAEF 2010

Egypt-Japan University of Science and Technology (E-JUST)

E-JUST

Network Infrastructure

▪ Prepare for Cloud services by establishing a dynamically expandable internet infrastructure through leased line fiber

▪ Provide the campus with IP telephony and Video Conferencing facilities

▪ Use Voice over data through PRI facilities for external phone/fax communication
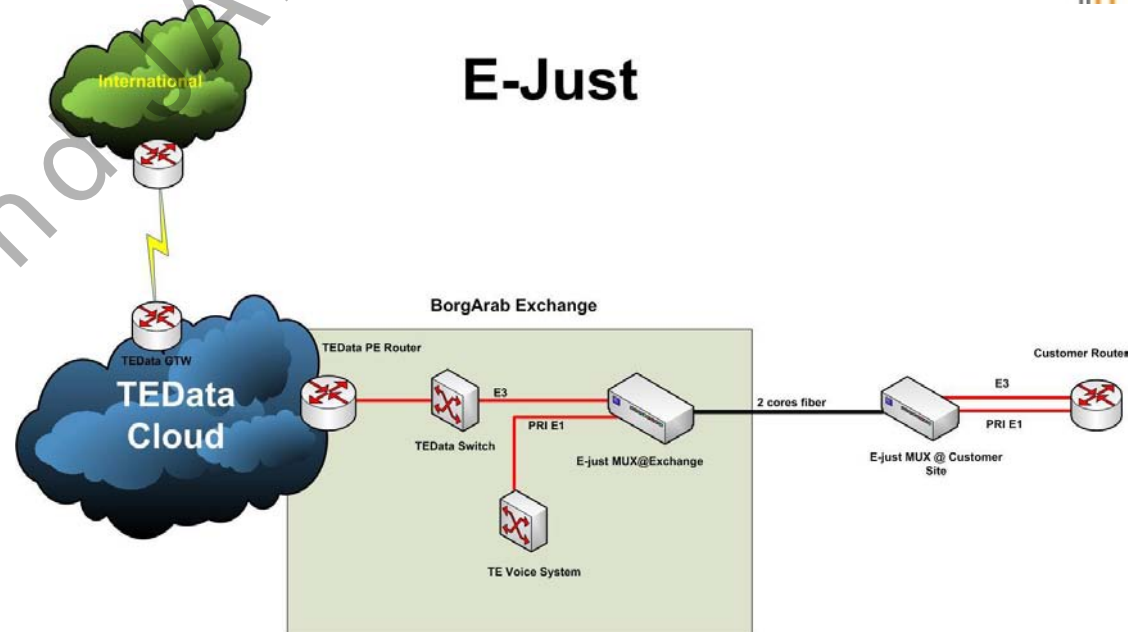
Hardware Infrastructure

Green ICT

Utilize the solar energy ▪

Save Electricity Cost ▪

Environmental Friendly ▪

Cloud Computing

 Speed & flexibility

 Managed as a single large resource

Receive services with elastic scaling ▪

Cost Cutting on IT Admin ▪

Technology Advancement ▪

External People checking on E-JUST website

Solar Power Station

Cloud Computing System

Researchers requiring on-demand processing power

Admin. Staff requiring access to e-Gov system
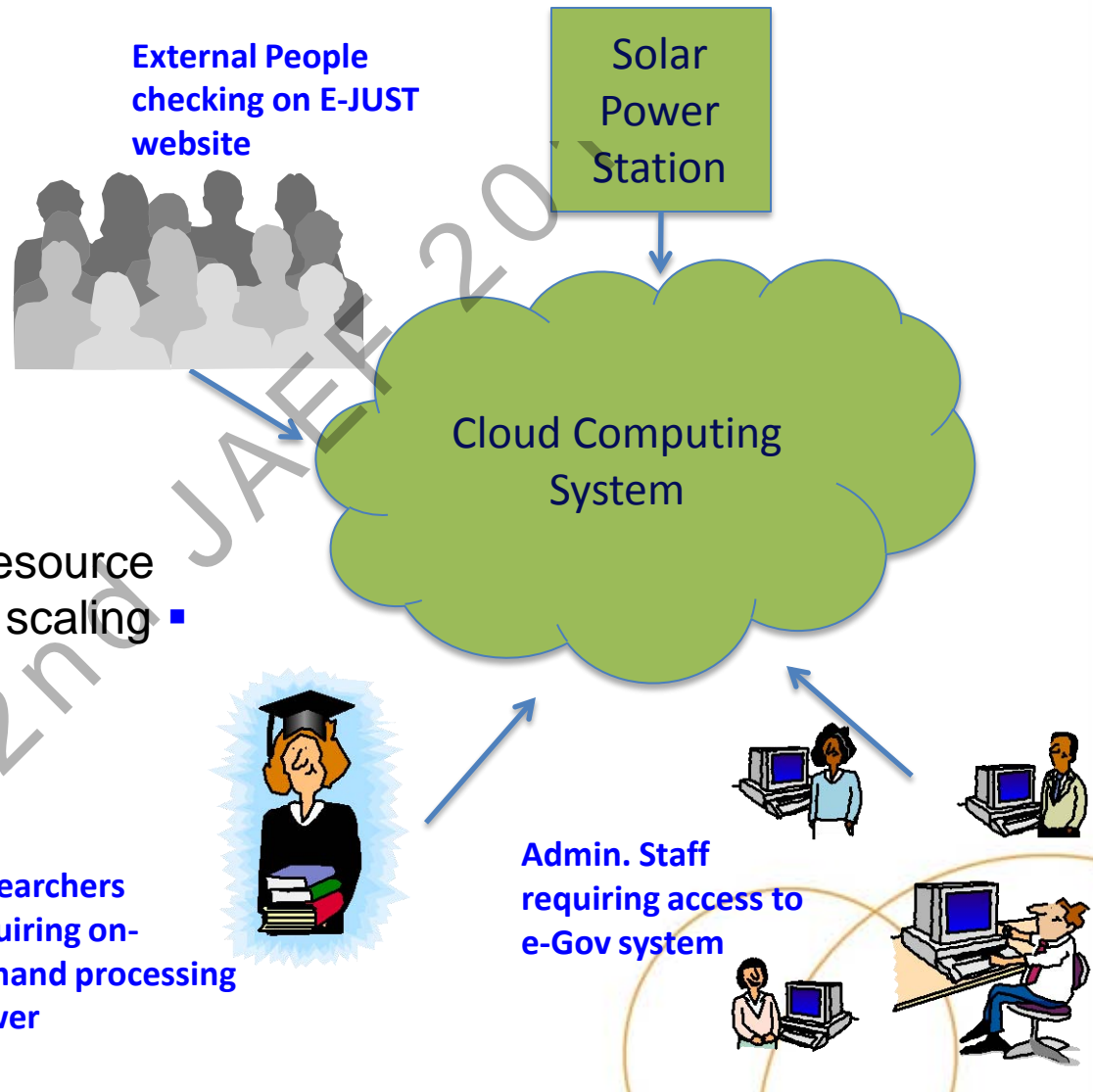
E-JUST Solar Energy Power Station

- The Solar Energy power station grant aid project has been awarded to E-JUST, with a grant of US$10 Million.
- The Photovoltaic (PV) based system will be installed at the residential site.
- Installed PV modules power = 420 k W
- Power generation is about 700 M.W.hr/year
- Benefits from the station:
  – Promote PV technology
  – Show room at the site
  – Pumping groundwater
  – Treating wastewater
  – Media exposure
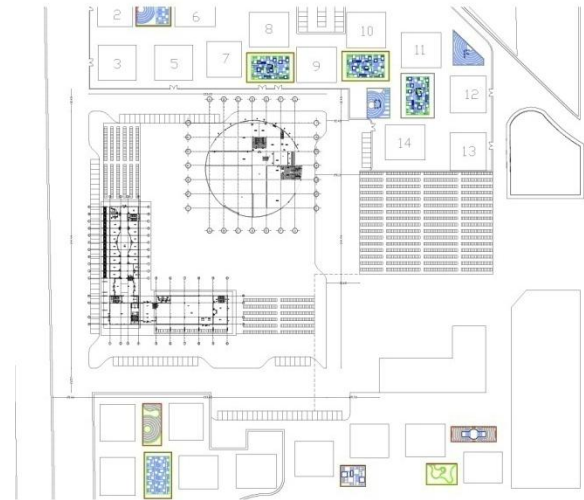
Software Infrastructure

The E-Gov system requirements exceeds the requirements of Egyptian universities

Significant focus on **research and innovation** administration

A quite extensive 'requirements documents' using 'object-oriented requirement analysis' is under preparation

The system is envisioned to use state-of-the art '**Service Oriented Architecture**'

Cloud Services

Cloud Computing Model
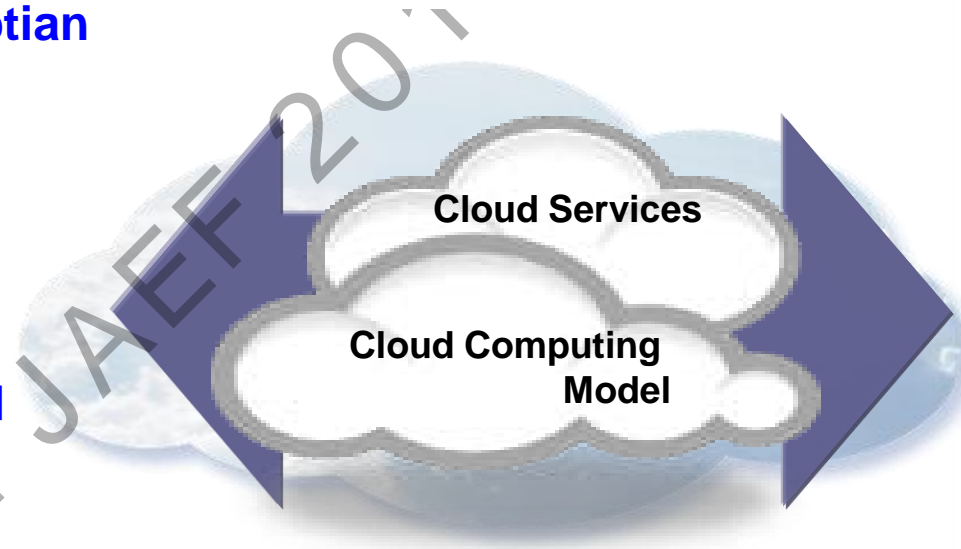
II. Smart City Research Projects

- Target the following areas:

  – High Performance Systems

  – Sensor Networks

  – Intelligent Systems

www.ejust.edu.eg

Smart City Facility

General Research Theme

- Problem: Alexandria suffers from common large scale problems associated with its huge population.
- The main objectives are to:
  - Provide **for better quality of life**
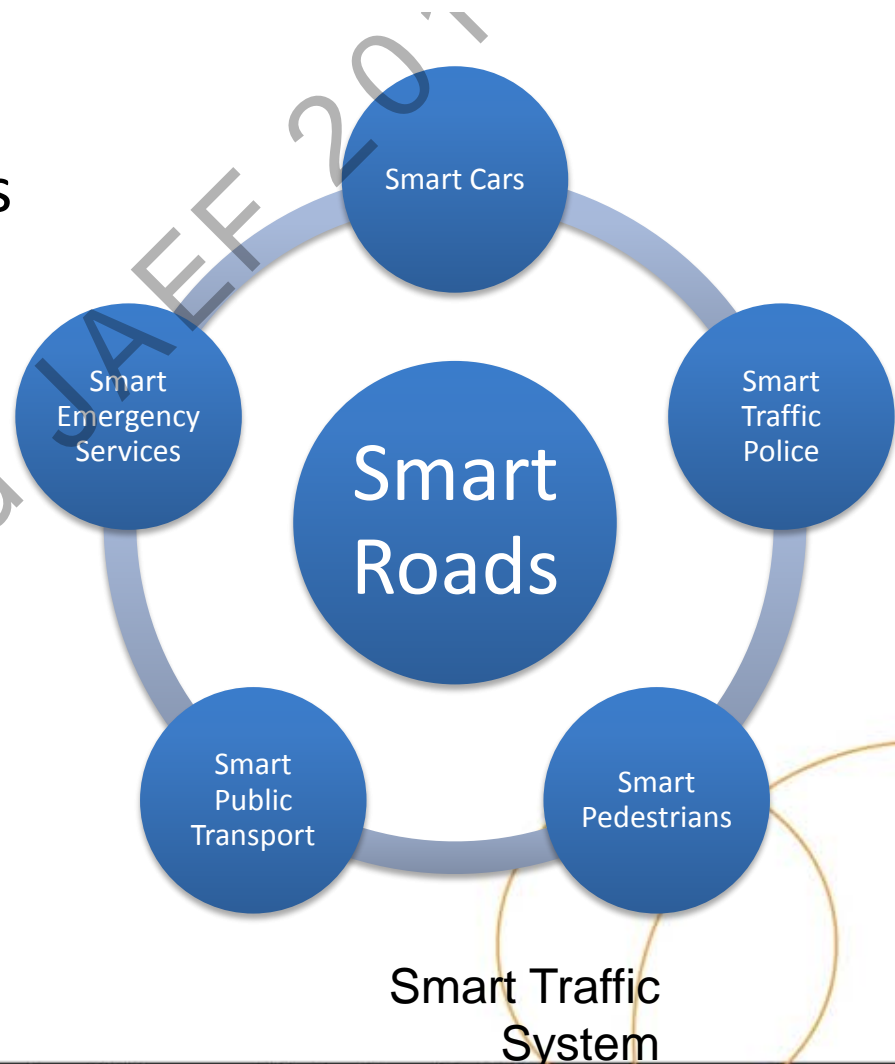 - And **better use of resources** in mega-cities
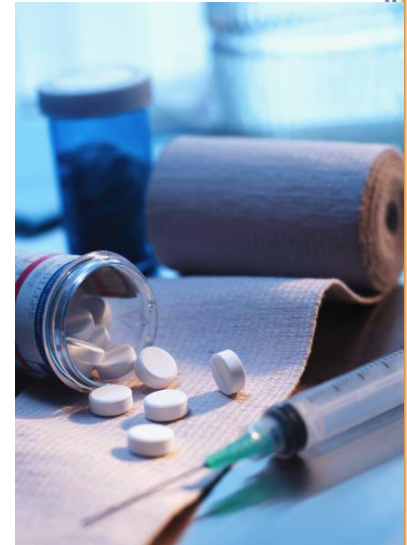
Traffic

Health
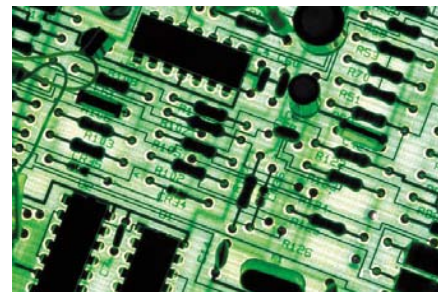
ICT

...

Smart City Research

I. Smart Traffic System

- One of the initial focuses of the facility is to study the traffic problems of Alexandria city and provide solutions for it.

- The facility includes researchers, faculty and graduate students from both Egypt and Japan.

Smart Cars
Smart Traffic Police
Smart Roads
Smart Emergency Services
Smart Public Transport
Smart Pedestrians

Smart Traffic System

Supercomputing on Mobile Devices

General Research Theme

- **Problem:** it is expected that mobiles phones will include 3000 processors by 2024. The problem is how to program them for performance and long battery life

- **Approach:**
  - start by a investigating GPUs (graphics processing units) on smart phones (such as iPhone)
  - Start by implementing a substantial real-time application such as Face Recognition on iPhone
  - Develop a software framework and extend for other applications / platforms

www.ejust.edu.eg
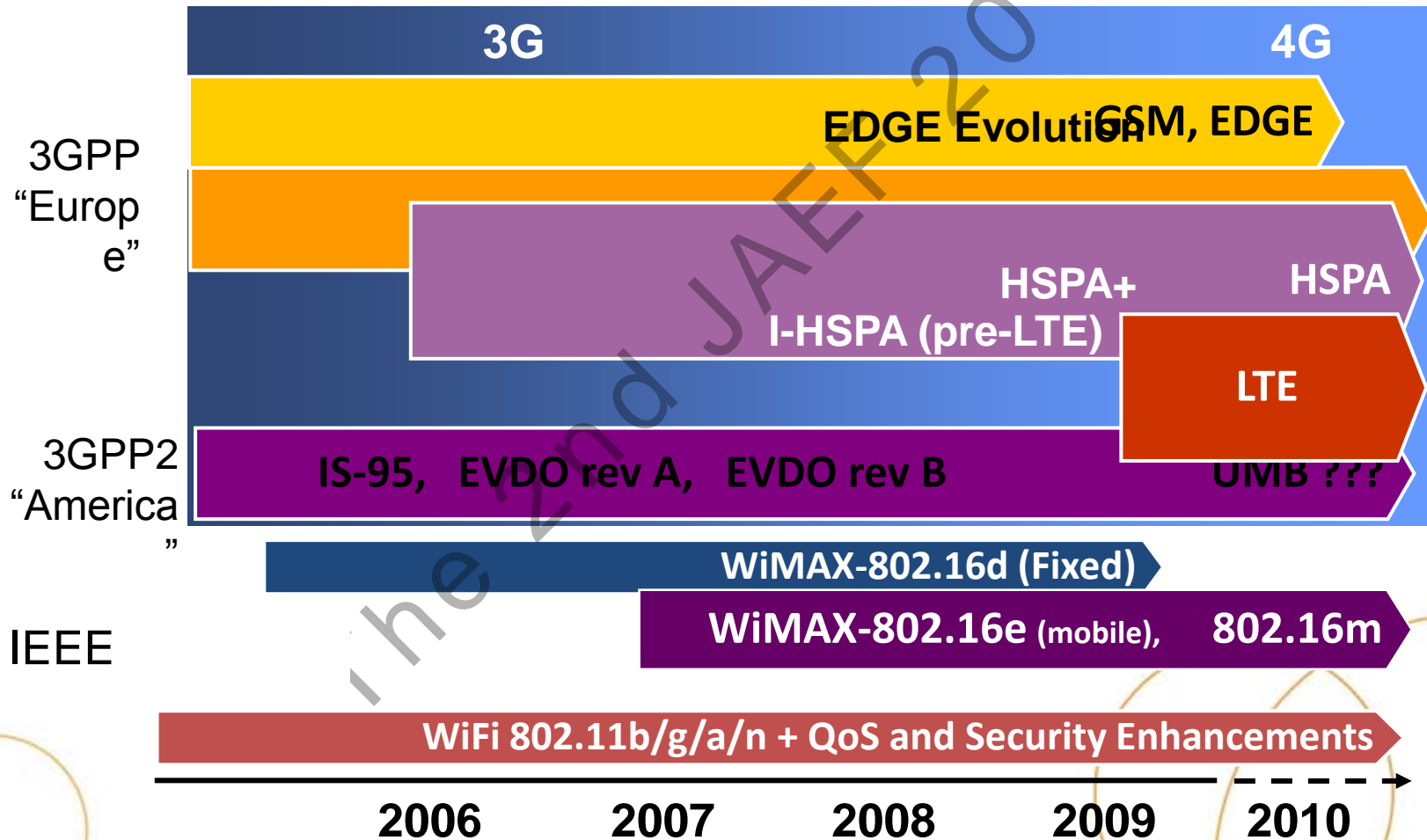
Secure Virtual Execution

- Problem:
  - Prior art focuses on **encrypting data**, but not computation; running on a **cloud requires both**!

- Solution:
  - Use secure virtual machine layer on-top of standard cloud virtual machine layer
  - Research facilities for encrypting computations which includes processing **encrypted data** without **decrypting them**

Egypt-Japan University of Science and Technology (E–JUST)

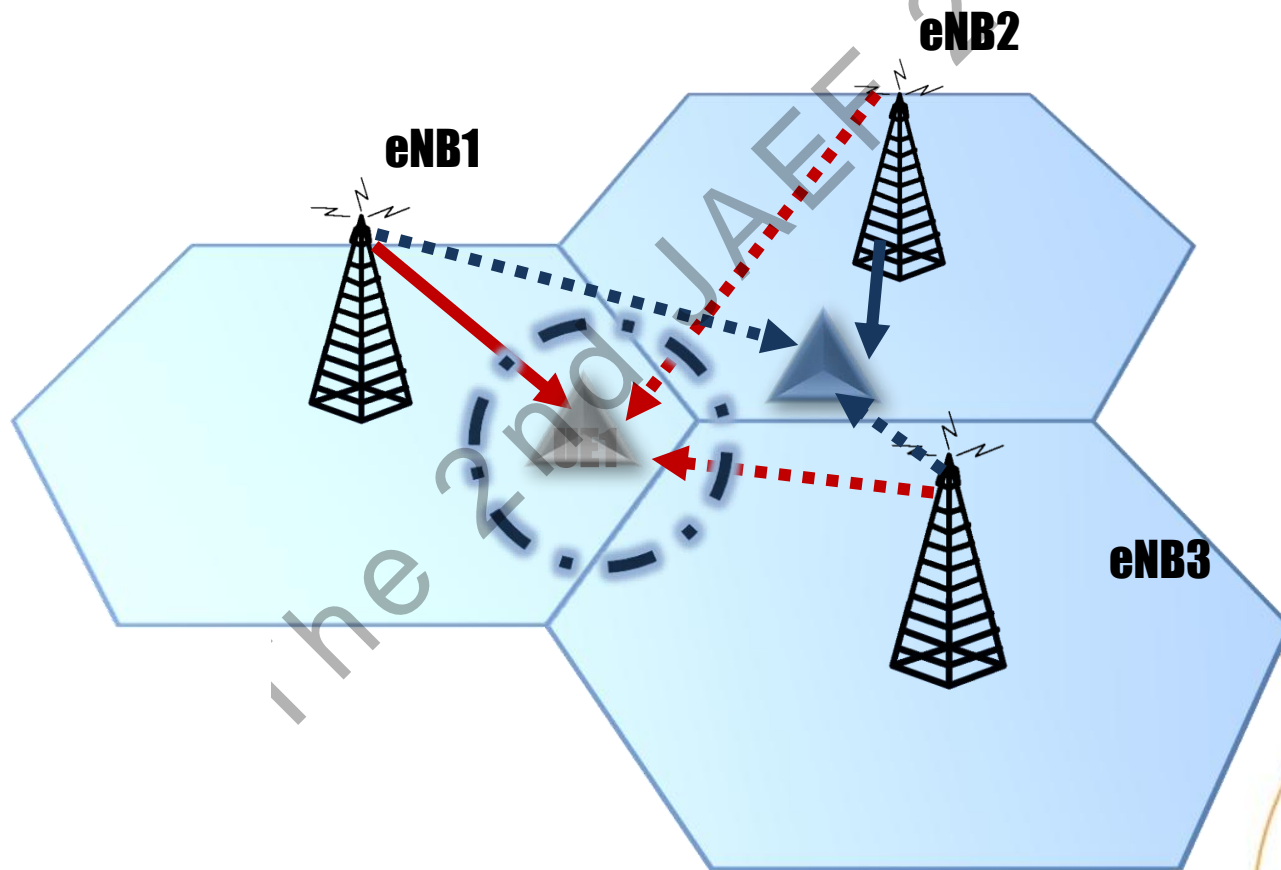# III. Wireless Research Projects
Wireless Research Facility

- Contains three inter-related core groups covering different stages of wireless system development:

  – Wireless Networking Group

  – Wireless Communications Group, and

  – Radio Frequency Design Group

4G Wireless Technology

3G — **4G**

3GPP "Europe"

- EDGE Evolution — GSM, EDGE
- HSPA+, I-HSPA (pre-LTE) — HSPA
- LTE

3GPP2 "America"
- IS-95, EVDO rev A, EVDO rev B — UMB ???

IEEE
- WiMAX-802.16d (Fixed)
- WiMAX-802.16e (mobile), 802.16m
- WiFi 802.11b/g/a/n + QoS and Security Enhancements

2006 2007 2008 2009 2010

Inter-cell Interference problem

- This reduces signal quality

Fractional Frequency Reuse

- Solves inter-cell interference problem.
- Increases spectral efficiency

Fractional Frequency Reuse

FFR and multi-BS MIMO deployment scenario
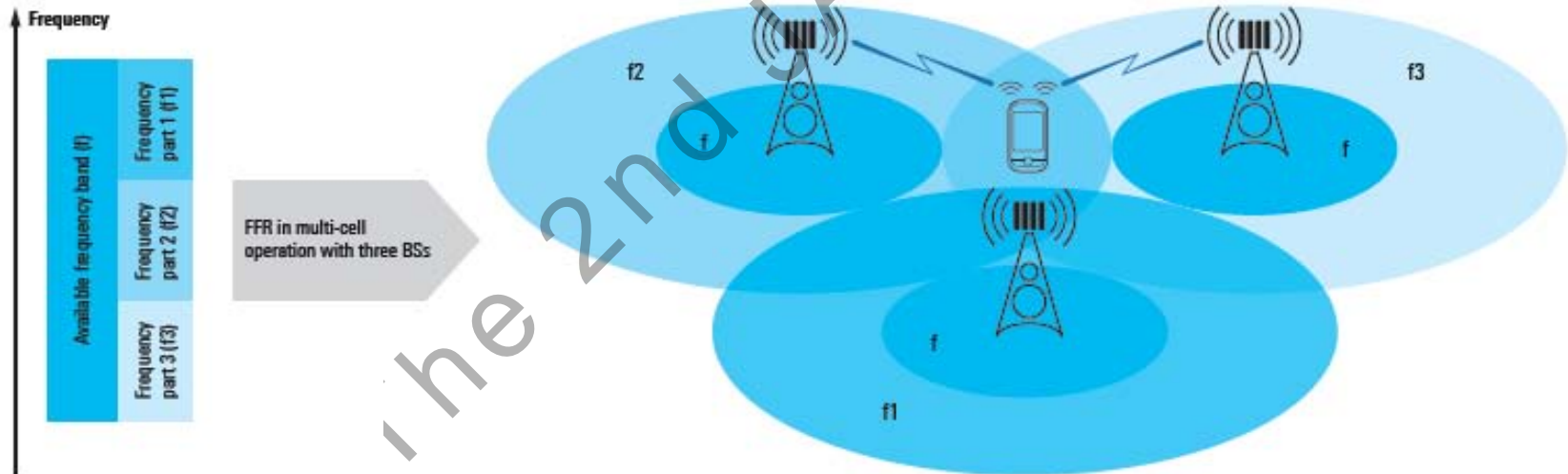
For better frequency spectrum usage, WiMAX™ IEEE 802.16m applies fractional frequency reuse (FFR). In FFR, adjacent base stations use the whole available frequency spectrum in non-overlapping areas. In overlapping areas, the frequency band is divided among the base stations. This reduces interference and also enables a mobile terminal located in an overlapping area to connect to more than one base station, which is referred to as multi-BS MIMO.

Courtesy of Rohde and Schwarz

Cognitive Radio Systems

- Motivation Behind Cognitive Radio.
- What is cognitive Radio ?
- Application Prospects of Cognitive Radio.
- Standardizing Cognitive Radio.
- PHY design in cognitive Radio: The possibilities.
- Research Ideas for PHY design of Cognitive Radio.

www.ejust.edu.eg

Motivation Behind Cognitive Radio

- Spectrum can be looked at as a precious natural resource that is often ill-used.

- How ?

  1. Some frequency bands in the spectrum are largely unoccupied most of the time. These regions can be referred as "white" regions.

  2. Some other frequency bands are only partially occupied. The partial occupancy labels these bands to be "grey" regions.

  3. The remaining frequency bands are heavily used. These frequencies can be suitably called "black" regions.

- **Result**: **Spectrum Holes**

Bands of frequencies assigned to a primary user, but, at a particular time and specific geographic location, the band is not being utilized by that user.

What is cognitive Radio ?

- **<u>Cognition</u>**: synthetic Intelligence achieved through *learning by understanding.*

- Cognitive radio concept allows secondary users, i.e. to use spectrum under the main condition that the performance of the primary user is not disturbed.

- How ?

  - Design the physical layer of the secondary user for two tasks:

    1. Interference mitigation.
    2. Transmit power control.

Research in Interference Mitigation

- PHY layer Design of secondary users:
  - Choosing channel coding algorithms that are robust under low SNR.
  - Choosing modulation techniques that are capable of delivering low BER for low SNR.

- Smart Antenna techniques, sectorizing and other related state of the art techniques that can be employed with MIMO for Interference mitigation.

Research in Transmit power control

- **Models of Networks**: Provide a robust mathematical model that represent the network.

- **Transmit power control algorithms**: Using game theory, optimal, sub-optimal algorithms for transmit power control can be derived.

Digital Video Broadcasting: DVB

- DVB is the European standard for digital video broadcasting.

- It is used extensively across the world.

- DVB is a transport mechanism for an MPEG2 encoded stream (more on this later) providing features which are not part of the MPEG2 standard.

DVB Research in Physical layer

- Designing good channel estimator.

- Designing good Equalizer.

- Desgining LDPC decoder.

The 2nd JAEF 2010

www.ejust.edu.eg

Green ICT Projects: Cognitive Software Defined Radio:

- *Low Power Sensor Nodes.*
- *Opportunistic Bandwidth -Efficient Communications*
- *Implementations and designs of different systems on the same hardware*
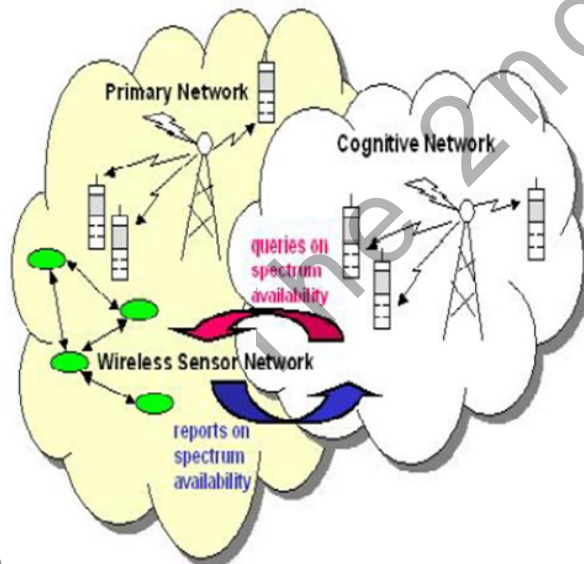
Egypt-Japan University of Science and Technology (E–JUST)

Green ICT Projects: Device-free localization for wireless networks:

- *Localize people without them carrying any device.*

- *Using same hardware for different functionality: Same WiFi network for communication and intrusion detection.*

- *Smart homes: Automatically turn off devices based on human sensing*

Egypt-Japan University of Science and Technology (E-JUST)
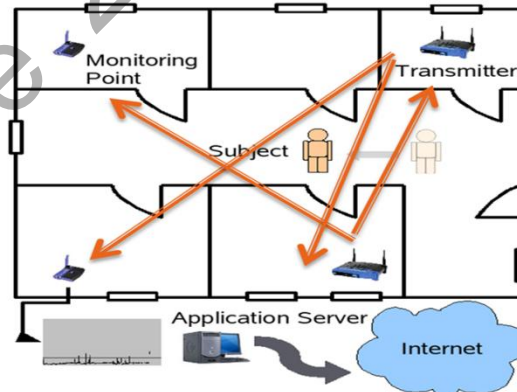
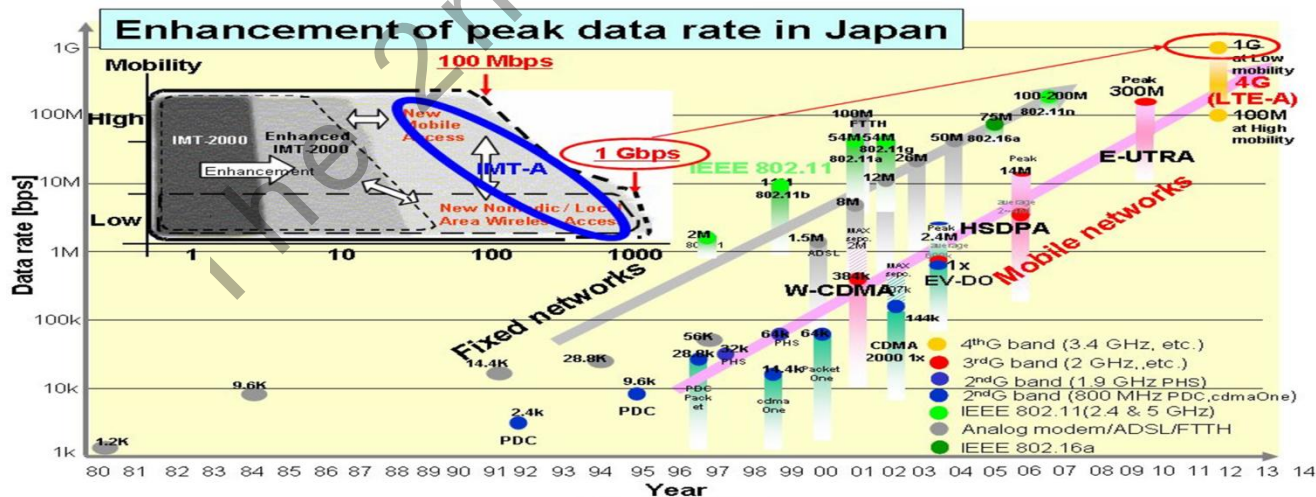# Green ICT Projects: Low Power Wireless Transceiver Design

- *Transceivers with minimal number of active components*

- *Energy scavenging*

- *Power management*

- *Network on Chip*

- *Fast Parallel Computing*

PE or Core
Network Adapter
Router
Link
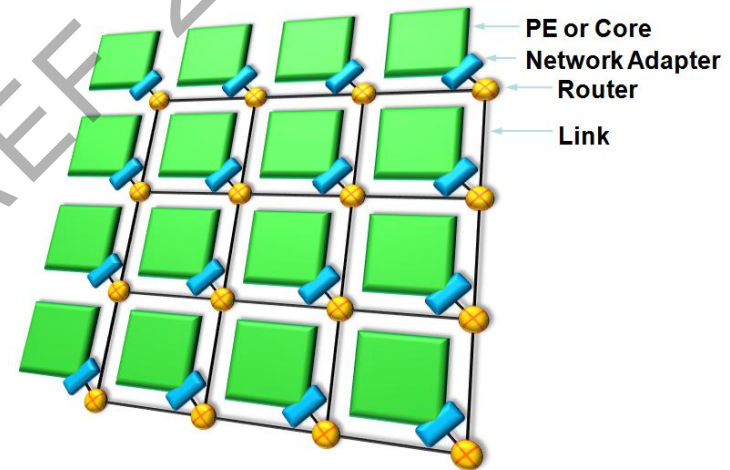
A 4-by-4 grid structured NoC and its fundamental elements

Egypt-Japan University of Science and Technology (E-JUST)

www.ejust.edu.eg

Green ICT Projects: Energy Efficient Broadband Networks

- Radio Resource Management in LTE-Advanced Relay Networks
  - Scheduling, Power Control, Relaying techniques
- Cooperative Communications for 4G systems
- Optimization of LTE-Advanced Femto-cells

Enhancement of peak data rate in Japan

Egypt-Japan University of Science and Technology (E-JUST)

Collision Avoidance Automotive Radar

- Automotive radar allows an exact measurement of distance and relative velocity of objects in front, beside and behind the car, which improves the driver ability to perceive objects during bad optical visibility or objects hidden in the blind spot

- Automotive radar facilitate driver safety and convenience:
  - Collision warning
  - Side crash detection
  - Adaptive cruise control

- Currently automotive radars are implemented in premium class cars to increase the driver safety and security

- The aim of this project is to allow a wide-spread use of low cost radar sensors designed to suit Egypt's environment and road conditions in all types of cars

- Project developed with researchers from Kyushu University and an Egyptian industrial partner

Low power, Low Voltage, 2.4 GHz Transceiver Front End

- The need for low power 2.4 GHz transceivers is fuelled by the increasing demand for wireless systems for sensing and monitoring applications

- Low power transceivers are used in industrial sensors, home automation, wireless data communication, alarm and security systems and intelligent sports equipment

- Existing 2.4 GHz transceiver solutions are either power hungry or need high power supplies to operate

- The project objective is to design an integrated, low power, low voltage 2.4 GHz transceiver

- Due to the wide range of ISM band transceivers applications, achieving the project objective will enable our industrial supporter to establish technological leadership in 2.4 GHz transceiver design and become a major player in this market

IV. Optical Applications

- Optical Burst Switching Networks (OBS) for high data rate transmission over optical fibers.

- Effect of the phase induced intensity noise (PIIN) imposes restrictions on the SAC-OCDMA OBS system capacity

- Optical OFDM

E-JUST Research Supporters and Partners (1 of 5)

- Science and Technology Development Fund (STDF), Egypt.

- Research Development and Innovation (RDI) Program, Egypt.

- National Telecommunications Regulatory Authority (NTRA), Egypt.

- Information Technology Industry Development Agency (ITIDA), Egypt.

- Qatar National Research Fund (QNRF), Qatar.

Egypt-Japan University of Science and Technology (E–JUST)

E-JUST Research Supporters and Partners (2 of 5)

- Networking Systems Lab (NSL), Qatar.
- IBM Cooperation, USA.
- IBM Center for Advanced Studies, Egypt.
- INTEL Cooperation Egypt/USA.
- Google Inc., USA.
- Microsoft Cooperation, EGYPT/USA.
- Mentor Graphics, EGYPT/USA.
- Silicon Vision Innovative Solutions, Egypt.
- Vimov Inc., Egypt.
- Business Link, Egypt.

64

Egypt-Japan University of Science and Technology (E-JUST)

E-JUST Research Supporters and Partners (3 of 5)

- National Research Centre, Cairo, Egypt.

- Egyptian Petroleum Research Institute (EPRI), Egypt.

- Water Pollution Research Dept. Cairo, Egypt.

- Kyushu University, Japan.

- Alexandria University, Egypt.

- Mubarak City for Scientific Research & Technology Applications (MuCSAT).

- Egyptian National Authority for Remote Sensing and Space Sciences.

- Nile University., Egypt.

65

Egypt-Japan University of Science and Technology (E-JUST)

E-JUST Research Supporters and Partners (4 of 5)

- American University in Cairo, Egypt.

- CARTE Team Loria Lab, Nancy, France.

- Center de Biotechnologie, Tunisia.

- University of Ottawa, Canada.

- University of Florida, USA.

- Ohio State University, USA.

- Pennsylvania State University, USA.

- Purdue School of Engineering and Technology, USA.

- Qatar University, Qatar.

Egypt-Japan University of Science and Technology (E-JUST)

E-JUST Research Supporters and Partners (5 of 5)

- Toyohashi University of Technology, Japan.

- Waseda University, Japan.

- Varkon Semiconductors, Egypt.

- Egyptian National Authority for Remote Sensing and Space Sciences

- Carnegie Mellon University – Qatar.

- Academy of Scientific Research.

- Fraunhofer Institute (UMSICHT), Germany.

- University of Ottawa, Canada.

- Advanced Research Project (ARP), ITAC, Egypt.

Egypt-Japan University of Science and Technology (E-JUST)